

50

Access DB# 116864

## SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: BRIAN QUANGLE Examiner #: 79178 Date: 03/15/04  
Art Unit: 2623 Phone Number 30 5-5083 Serial Number: 09/782,445  
Mail Box and Bldg/Room Location: 1K14B46 Results Format Preferred (circle): PAPER DISK E-MAIL

**If more than one search is submitted, please prioritize searches in order of need.**

\*\*\*\*\*

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Method of Shape Recognition using Postulated Lines  
Inventors (please provide full names): Josh Goldfoot

Earliest Priority Filing Date: 02/12/2001

*\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

- Please see attachment for
- direction of search
  - drawing
  - abstract
  - claims

\*\*\*\*\*



# STIC Search Results Feedback Form

**EIC 2600**

Questions about the scope or the results of the search? Contact *the EIC searcher* or contact:

**Pamela Reynolds, EIC 2600 Team Leader**  
**306-0255, CPK2-3C03**

## Voluntary Results Feedback Form

➤ I am an examiner in Workgroup:  Example: 2612

➤ Relevant prior art found, search results used as follows:

- ☐ 102 rejection
- ☐ 103 rejection
- ☐ Cited as being of interest.
- ☐ Helped examiner better understand the invention.
- ☐ Helped examiner better understand the state of the art in their technology.

*Types of relevant prior art found:*

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature  
(journal articles, conference proceedings, new product announcements etc.)

➤ Relevant prior art not found:

- ☐ Results verified the lack of relevant prior art (helped determine patentability).
- ☐ Results were not useful in determining patentability or understanding the invention.

**Comments:**

**BEST AVAILABLE COPY**

Drop off or send completed forms to STIC/EIC 2600 CPK2-3C03





# STIC Search Report

## EIC 2600

STIC Database Tracking Number: 116864

TO: Brian Le  
Location: PK1 – 4B40  
Art Unit : 2623  
Monday, March 15, 2004

Case Serial Number: 09782445

From: Vamshi Kalakuntla  
Location: EIC 2600  
PK2-3C03  
Phone: 306-0254

Vamshi.kalakuntla@uspto.gov

### Search Notes

Dear Brian Le;

Attached please find the results of your search request 09782445.  
I used the search strategy I emailed to you to edit.  
I searched the standard Dialog files, IBM TDBs, IEEE, and DTIC STINET.

If you would like a re-focus please let me know.  
Please feel free to contact me if you have questions or concerns. Thank you and have a great day.

*Please take a moment and fill out the attached feedback form. Thank you.*



? show files;ds;save temp;log hold  
File 344:Chinese Patents Abs Aug 1985-2004/Mar  
(c) 2004 European Patent Office  
File 347:JAPIO Nov 1976-2003/Nov(Updated 040308)  
(c) 2004 JPO & JAPIO  
File 348:EUROPEAN PATENTS 1978-2004/Mar W01  
(c) 2004 European Patent Office  
File 349:PCT FULLTEXT 1979-2002/UB=20040311,UT=20040304  
(c) 2004 WIPO/Univentio  
File 350:Derwent WPIX 1963-2004/UD,UM &UP=200417  
(c) 2004 Thomson Derwent

| Set | Items | Description                      |
|-----|-------|----------------------------------|
| S1  | 1     | AU=(GOLDFOOT, J? OR GOLDFOOT J?) |

1/5/1 (Item 1 from file: 350)  
DIALOG(R) File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

015067674 \*\*Image available\*\*  
WPI Acc No: 2003-128190/200312  
XRPX Acc No: N03-101786

Scribble shape recognition method for pen-based computer system, involves  
determining number of points, curved and straight sides in scribble

Patent Assignee: GOLDFOOT J (GOLD-I)

Inventor: GOLDFOOT J

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No      | Kind | Date     | Applicat No   | Kind | Date     | Week     |
|----------------|------|----------|---------------|------|----------|----------|
| US 20020146175 | A1   | 20021010 | US 2001782445 | A    | 20010212 | 200312 B |

Priority Applications (No Type Date): US 2001782445 A 20010212

Patent Details:

| Patent No      | Kind | Lan | Pg | Main IPC    | Filing Notes |
|----------------|------|-----|----|-------------|--------------|
| US 20020146175 | A1   |     | 23 | G06K-009/00 |              |

Abstract (Basic): US 20020146175 A1

NOVELTY - The scribble is recognized as a line segment when exactly two points are present. The scribble is recognized as closed plane figure, when there are more than two points and the number of straight sides are greater. The scribble is recognized as a spline or a closed spline when the number of curved sides are greater.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

- (1) Computer system;
- (2) Import point identification method; and
- (3) Curve or line segment identification method.

USE - For pen-based computer system (claimed).

ADVANTAGE - Quickly identifies the shape of the scribble and reduces the memory required to store a user's drawing, by identifying the important points and determining the number of curved and straight edges in the scribble.

DESCRIPTION OF DRAWING(S) - The figure shows a flow chart illustrating shape recognition process.

pp; 23 DwgNo 1/6

Title Terms: SCRIBBLE; SHAPE; RECOGNISE; METHOD; PEN; BASED; COMPUTER; SYSTEM; DETERMINE; NUMBER; POINT; CURVE; STRAIGHT; SIDE; SCRIBBLE

Derwent Class: T01; T04

International Patent Class (Main): G06K-009/00

International Patent Class (Additional): G06K-009/46

File Segment: EPI

?

File 2:INSPEC 1969-2004/Mar W1  
(c) 2004 Institution of Electrical Engineers

File 6:NTIS 1964-2004/Mar W1  
(c) 2004 NTIS, Intl Cpyrght All Rights Res

File 8:Bi Compendex(R) 1970-2004/Mar W1  
(c) 2004 Elsevier Eng. Info. Inc.

File 34:SciSearch(R) Cited Ref Sci 1990-2004/Mar W1  
(c) 2004 Inst for Sci Info

File 35:Dissertation Abs Online 1861-2004/Feb  
(c) 2004 ProQuest Info&Learning

File 65:Inside Conferences 1993-2004/Mar W2  
(c) 2004 BLDSC all rts. reserv.

File 94:JICST-EPlus 1985-2004/Mar W1  
(c)2004 Japan Science and Tech Corp(JST)

File 95:TEME-Technology & Management 1989-2004/Feb W4  
(c) 2004 FIZ TECHNIK

File 99:Wilson Appl. Sci & Tech Abs 1983-2004/Feb  
(c) 2004 The HW Wilson Co.

File 144:Pascal 1973-2004/Mar W1  
(c) 2004 INIST/CNRS

File 233:Internet & Personal Comp. Abs. 1981-2003/Sep  
(c) 2003 EBSCO Pub.

File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec  
(c) 1998 Inst for Sci Info

File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13  
(c) 2002 The Gale Group

File 603:Newspaper Abstracts 1984-1988  
(c)2001 ProQuest Info&Learning

File 483:Newspaper Abs Daily 1986-2004/Mar 12  
(c) 2004 ProQuest Info&Learning

File 248:PIRA 1975-2004/Feb W5  
(c) 2004 Pira International

| Set | Items    | Description  |
|-----|----------|--|
| S1  | 11268703 | SHAPE? ? OR FORM? ? OR FIGURE? ? OR POSTURE?? OR STRUCTUR?   |
| S2  | 37881    | SCRIBBL? OR SCRAWL??? OR CACOGRAPH? OR HANDDRAW? OR GRAFFI-<br>TI OR HANDWRIT? OR (HAND OR SCRATCH?) (3N) (DRAW? OR WRIT?) |
| S3  | 15070    | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N) S2                                     |
| S4  | 890834   | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N) S1                                     |
| S5  | 3817301  | (POINT? ? OR TARGET? ? OR DOT OR DOTS OR SPOT OR SPOTS)  |
| S6  | 2277527  | DISTANC? OR LENGTH? OR CLOSENESS OR PROXIMIT? OR (LOCATION?<br>? OR PLACEMENT?) (3N) S5                                    |
| S7  | 4941     | (THRESHOLD? ? OR PREDETERMIN? OR PRE() DETERMIN?) (3N) S6  |
| S8  | 1601207  | CURVE? ? OR ARC OR ARCH? ? OR BEND OR BENDS OR CURL OR CUR-<br>LS OR TRAJECTOR? OR SPLINE                                  |
| S9  | 3230808  | STRAIGHT? OR LINE? ? OR ALIGN? OR UNBENT OR UNCURLLED OR UN-<br>( ) S8   |
| S10 | 3475     | S3 AND S4  |
| S11 | 1        | S10 AND S7   |
| S12 | 266      | S10 AND S6   |
| S13 | 90       | S12 AND (S8 OR S9)   |
| S14 | 9        | S12 AND S8 AND S9  |
| S15 | 9        | RD S14 (unique items)  |
| S16 | 8        | S15 NOT (S11 OR PY>2001)   |
| S17 | 3        | S13 AND SPLINE   |
| S18 | 2        | RD S17 (unique items)  |
| S19 | 2        | S18 NOT (S11 OR S16 OR PY>2001)  |
| S20 | 0        | AU=(GOLDFOOT, J? OR GOLDFOOT J?)   |
| S21 | 633      | S5 AND S7  |

|     |   |            |
|-----|---|------------|
| S22 | 0 | S21 AND S3 |
| S23 | 0 | S21 AND S2 |

11/3,K/1 (Item 1 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

03949003 JICST ACCESSION NUMBER: 99A0202360 FILE SEGMENT: JICST-E  
A signature verification method based on the extracted displacement  
function.  
MIZUKAMI YOSHIKI (1); MIIKE HIDETOSHI (1); YOSHIMURA MITSU (2); YOSHIMURA  
ISAO (3)  
(1) Yamaguchi Univ., Fac. of Eng.; (2) Nagoyashidai Geijutsuko; (3) Sci.  
Univ. of Tokyo, Fac. of Eng.  
Denshi Joho Tsushin Gakkai Gijutsu Kenkyu Hokoku(IEIC Technical Report  
(Institute of Electronics, Information and Communication Enginners),  
1998, VOL.98,NO.489(PRMU98 136-149), PAGE.87-93, FIG.3, TBL.7, REF.11  
JOURNAL NUMBER: S0532BBG  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

...ABSTRACT: authentic signatures added by a penalty of the degree of  
smoothness of the displacement function. The counter signature is  
accepted as genuine if the observed distance is below a threshold ,  
and rejected otherwise. An experiment to evaluate the effectiveness of  
the proposed method achieved a value as low as 25.5% in an average  
error...

DESCRIPTORS: handwritten character recognition ;  
...BROADER DESCRIPTORS: figure pattern recognition ;  
?



16/3,K/1 (Item 1 from file: 34)  
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
(c) 2004 Inst for Sci Info. All rts. reserv.

04588638 Genuine Article#: TV469 No. References: 41  
Title: **HIDDEN MARKOV-MODELS IN TEXT RECOGNITION**  
Author(s): ANIGBOGU JC; BELAID A  
Corporate Source: SCHLUMBERGER AUSTIN SYST CTR/AUSTIN//TX/78720; INST NATL  
RECH INFORMAT & AUTOMAT LORRAINE,CRIN,CNRS/F-54506 VANDOEUVRE  
NANCY//FRANCE/  
Journal: INTERNATIONAL JOURNAL OF PATTERN RECOGNITION AND ARTIFICIAL  
INTELLIGENCE, 1995, V9, N6 (DEC), P925-958  
ISSN: 0218-0014  
Language: ENGLISH Document Type: ARTICLE (Abstract Available)

...Abstract: for font identification before actual character recognition is performed. This has the advantage of sure character identification as well as text reproduction in its original form . The font identification is based on decision trees where the characters are automatically arranged differently in confusion classes according to the physical characteristics of fonts.

The character recognizers are built around the first and second order hidden Markov models (HMM) as well as Euclidean distance measures. The HMMs use the Viterbi and the Extended Viterbi algorithms to which enhancements were made. Also present is a majority-vote system that polls...

...Research Fronts: COMPRESSION OF DIGITAL IMAGES)  
94-1199 001 (CONTEXT-FREE GRAPH LANGUAGES; HIDDEN MARKOV-MODELS;  
STOCHASTIC TREE FUNCTIONS; TROPICAL SEMIRING; FINITE AUTOMATA)  
94-6062 001 (OFF- LINE HANDWRITTEN TEXT; PRINTED DOCUMENT  
RECOGNITION ; TEMPORAL TRAJECTORIES )

16/3,K/2 (Item 1 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

04697077 JICST ACCESSION NUMBER: 00A0882523 FILE SEGMENT: JICST-E  
An On- line Character Recognition Algorithm RAV (Reparameterized Angle Variations).  
KOBAYASHI MITSURU (1); MASAKI SHIN'YA (1); MIYAMOTO OSAMU (1); NAKAGAWA  
YOICHI (1); KOMIYA YOSHIMITSU (1); MATSUMOTO TAKASHI (1)  
(1) Waseda Univ., Sch. of Sci. & Eng.  
Joho Shori Gakkai Ronbunshi(Transactions of Information Processing Society  
of Japan), 2000, VOL.41,NO.9, PAGE.2536-2544, FIG.9, TBL.1, REF.12  
JOURNAL NUMBER: Z0778AAZ ISSN NO: 0387-5806  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

An On- line Character Recognition Algorithm RAV (Reparameterized Angle Variations).

ABSTRACT: With the advent of popularity of pen input devices including PDA, PC, word processor, accurate on- line character recognition starts playing a vitally important role. This paper proposes a new algorithm for pen input on- line character recognition which is extremely robust

against stroke connections (stroke number variations) while maintaining a reasonable degree of robustness against stroke order variations. The proposed algorithm RAV has several important features; (i) Raw data consisting of pen position **trajectory** is transformed into angle variation and resampled in a simple but very effective manner, (ii) A special **distance** function is proposed to evaluate **distance** between two characters taking into account the angle variations as well as pen up/down variations, and (iii) An automatic dictionary generation scheme is proposed...

DESCRIPTORS: **handwritten character recognition** ;  
...BROADER DESCRIPTORS: **figure pattern recognition** ;

16/3,K/3 (Item 2 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

04594464 JICST ACCESSION NUMBER: 00A0346365 FILE SEGMENT: JICST-E  
**An Attempt of Individual Identification from Handwritten Characters  
Based on the Linear- and Curvilinear-Features.**

SATO TSUYOSHI (1); MIYAKAWA MICHIO (2); ISHIWATA MASAMICHI (3)  
(1) Anritsu Corp.; (2) Niigata Univ.; (3) NTT Data Corp., JPN  
Denki Gakkai Ronbunshi. C(Transactions of the Institute of Electrical  
Engineers of Japan. C), 2000, VOL.120-C,NO.3, PAGE.397-403, FIG.9,  
TBL.3, REF.11

JOURNAL NUMBER: S0810AAN ISSN NO: 0385-4221  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

**An Attempt of Individual Identification from Handwritten Characters  
Based on the Linear- and Curvilinear-Features.**

...ABSTRACT: Specific features appeared in handwritten characters can be used to discriminate a person from the others without invading privacy. This paper deals with the individual **identification** from **handwritten** characters in off- line systems. An effective method to extract the specific features appeared in the **straight** and/or the **curved** part of handwritten characters is described in this paper. Our feature extraction method is based on calculation of the **length** and inclination of **straight - lines** and parameters of the circular arcs that are found in the binarized and thinned **lines** of the characters. Since the distribution of those specific features depends on the writer, the distribution pattern can be used for the purpose of individual...

DESCRIPTORS: **handwritten character recognition** ;  
...BROADER DESCRIPTORS: **figure pattern recognition** ;

16/3,K/4 (Item 3 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

03439858 JICST ACCESSION NUMBER: 97A0987827 FILE SEGMENT: JICST-E  
**On- Line Handwritten Character Recognition Based on Non-Euclidean  
Distance .**

UCHIYAMA TADASU (1); SONEHARA NOBORU (1); TOKUNAGA YUKIO (1)  
(1) Nippon Telegraph & Telephone Corp., Human Interface Lab.  
Denshi Joho Tsushin Gakkai Ronbunshi. D,2(Transactions of the Institute of

Electronics, Information and Communication Engineers. D-2), 1997,  
VOL.J80-D-2,NO.10, PAGE.2705-2712, FIG.14, TBL.3, REF.7  
JOURNAL NUMBER: L0197AAM ISSN NO: 0915-1923  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

On- Line Handwritten Character Recognition Based on Non-Euclidean  
Distance .

DESCRIPTORS: handwritten character recognition ; ...

... distance ;

...BROADER DESCRIPTORS: figure pattern recognition ; ...

... length ; ...

... curved surface

16/3,K/5 (Item 4 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

01764866 JICST ACCESSION NUMBER: 93A0446219 FILE SEGMENT: JICST-E  
Special Issue on Image Processing and Understanding. A Text-Independent  
Off- Line Writer Identification Method for Japanese and Korean  
Sentences.

YOSHIMURA M (1); YOSHIMURA I (2); KIM H B (3)

(1) Chubu Univ., Kasugai-shi, JPN; (2) Science Univ. Tokyo, Tokyo, JPN

; (3) Nagoya Univ., Nagoya-shi, JPN

IEICE Trans Inf Syst(Inst Electron Inf Commun Eng), 1993, VOL.E76-D,NO.4,  
PAGE.454-461, FIG.5, TBL.2, REF.8

JOURNAL NUMBER: L1371AAJ ISSN NO: 0916-8532

UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165

LANGUAGE: English COUNTRY OF PUBLICATION: Japan

DOCUMENT TYPE: Journal

ARTICLE TYPE: Original paper

MEDIA TYPE: Printed Publication

Special Issue on Image Processing and Understanding. A Text-Independent  
Off- Line Writer Identification Method for Japanese and Korean  
Sentences.

ABSTRACT: This paper proposes an off- line text-independent writer  
identification method applicable to Japanese and Korean sentences. It  
is assumed that the writer of a writing in question exists in a...

...method, relative frequencies of some model patterns are counted on the  
binary pattern of each writing and are used as the feature to measure  
the distance between two writings. Based on a modified Mahalanobis'  
distance for this feature, the person whose reference writing is  
nearest to the writing in question is judged as the writer. The  
effectiveness of the proposed...

...DESCRIPTORS: handwritten character recognition ; ...

...circular arc ;

...BROADER DESCRIPTORS: figure pattern recognition ; ...

... curve ; line ;

16/3,K/6 (Item 5 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
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00706305 JICST ACCESSION NUMBER: 88A0581713 FILE SEGMENT: JICST-E  
**A decomposition algorithm of binary images into significant substructures.**  
ITO YUKITOSHI (1); ABE KEIICHI (1); ARCELLI CARLO (2)  
(1) Shizuoka Univ., Faculty of Engineering; (2) Inst. Cibernetica, CNR,  
Naples, ITA  
Joho Shori Gakkai Zenkoku Taikai Koen Ronbunshu, 1988, VOL.37th,NO.3,  
PAGE.1552-1553, FIG.3, REF.3  
JOURNAL NUMBER: S0731ACN  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:621.397.3  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Conference Proceeding  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

...DESCRIPTORS: **distance ; handwritten character recognition ; curve ;**  
...BROADER DESCRIPTORS: **length ; ...**  
... **figure pattern recognition ; ...**  
... **line ;**

16/3,K/7 (Item 1 from file: 95)  
DIALOG(R)File 95:TEME-Technology & Management  
(c) 2004 FIZ TECHNIK. All rts. reserv.

01089152 I97034797223  
**Automatic on- line signature verification**  
(Automatische Online-Signaturverifikation)  
Nalwa, VS  
AT&T Bell Labs., Holmdel, NJ, USA  
Proceedings of the IEEE, v85, n2, pp215-239, 1997  
Document type: journal article Language: English  
Record type: Abstract  
ISSN: 0018-9219

**Automatic on- line signature verification**

**ABSTRACT:**

Automatic on- line signature verification is an intriguing intellectual challenge with many practical applications. I review the context of this problem and then describe my own approach to...

...primarily on the pen dynamics during the production of the signature. I propose a robust, reliable, and elastic local-shape-based model for handwritten on- line **curves** ; this model is generated by first parameterizing each on- line **curve** over its normalized **arc - length** and then representing along the **length** of the **curve** , in a moving coordinate frame, measures of the **curve** within a sliding window that are analogous to the position of the center of mass, the torque exerted by a force, and the moments of...

...DESCRIPTORS: **LETTER; HANDWRITING ; TORQUE; DEFECT; ERROR ANALYSIS ;**  
**DEFECT DETECTION; SIGNATURE ANALYSIS; ON LINE PROCESSING; MODEL STUDY;**  
**SIGNAL ANALYSIS; DIGITAL SIGNALS; SIGNAL RECOGNITION ; HANDWRITING**

**RECOGNITION ; SHAPE ; ARC LENGTH**

IDENTIFIERS: AUTOMATIC ON LINE SIGNATURE VERIFICATION; ELASTIC LOCAL  
SHAPE BASED MODEL; HANDWRITTEN ON LINE CURVES ; MOVING COORDINATE FRAME;  
SLIDING WINDOW; MOMENTS OF INERTIA; MASS DISTRIBUTION; BIASED HARMONIC MEAN  
; Zeichenerkennung; Online-Verarbeitung; Modelluntersuchung

16/3,K/8 (Item 1 from file: 144)

DIALOG(R) File 144:Pascal

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11003739 PASCAL No.: 93-0513246

**Recovering dynamic information from static handwriting**

Handwriting **processing** and recognition

BOCCIGNONE G; CHIANESE A; CORDELLA L P; MARCELLI A

PLAMONDON Rejean, ed

Univ. Naples Federico II, dip. informatica sistemistica, 80125 Naples,  
Italy

Ecole polytechnique Montreal, dep. genie electrique genie informatique,  
Montreal PQ H3C 3A7, Canada

International Graphonomics Society, International.

International Graphonomics Society IGS. Conference, 5 (Tempe AZ USA)

1991-10-27

Journal: Pattern recognition, 1993, 26 (3) 409-418

Language: English

Handwriting **processing** and recognition

It is generally agreed that the advantage of on- line character recognition methods with respect to off- line ones mostly relies on the availability of dynamic information. This mainly concerns the order in which the strokes forming characters have been drawn. In this paper we present and discuss a method which attempts, in the off- line case, to recover part of the lost script dynamics. The method makes it possible to reconstruct one of the most likely **trajectories** followed by the writer while drawing characters. It is based on a suitable implementation of good continuity criteria which take into account direction, **length** and width of the strokes making up characters

English Descriptors: Pattern recognition; Manuscript character; Thinning;  
OCR; Off- line **recognition** ; Dynamic information; Skeleton **shape**  
fidelity

French Descriptors: Reconnaissance forme; Caractere manuscrit;  
Amincissement; OCR; Reconnaissance hors **line** ; Information dynamique;  
Fidelite forme squelette

?

19/3,K/1 (Item 1 from file: 8)  
DIALOG(R)File 8: Ei Compendex(R)  
(c) 2004 Elsevier Eng. Info. Inc. All rts. reserv.

04443618 E.I. No: EIP96073242353  
Title: Using generative models for handwritten digit recognition  
Author: Revow, Michael; Williams, Christopher K.I.; Hinton, Geoffrey E.  
Corporate Source: Univ of Toronto, Toronto, Ont, Can  
Source: IEEE Transactions on Pattern Analysis and Machine Intelligence v  
18 n 6 Jun 1996. p 592-606  
Publication Year: 1996  
CODEN: ITPIDJ ISSN: 0162-8828  
Language: English

Title: Using generative models for handwritten digit recognition  
Abstract: We describe a method of recognizing handwritten digits by fitting generative models that are built from deformable B-splines with Gaussian 'ink generators' spaced along the length of the spline. The splines are adjusted using a novel elastic matching procedure based on the Expectation Maximization (EM) algorithm that maximizes the likelihood of the model generating...

Descriptors: Optical character recognition ; Data structures ; Algorithms; Pattern recognition ; Image analysis; Image segmentation; Mathematical models; Database systems

Identifiers: Generative models; Handwritten digit recognition ; Deformable model; Elastic net algorithm; Probabilistic model; Expectation maximization algorithm

19/3,K/2 (Item 1 from file: 94)  
DIALOG(R)File 94: JICST-EPlus  
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04757155 JICST ACCESSION NUMBER: 01A0091478 FILE SEGMENT: JICST-E  
A Study on the Global Deformation of Characters.  
KATO TSUYOSHI (1); OMACHI SHIN'ICHIRO (1); ASO HIROTOMO (1)  
(1) Tohokudai Daigakuinkogakukenyuka  
Denshi Joho Tsushin Gakkai Gijutsu Kenkyu Hokoku (IEIC Technical Report  
(Institute of Electronics, Information and Communication Engineers),  
2000, VOL.100, NO.359 (PRMU2000 86-95), PAGE.1-8, FIG.8, TBL.1, REF.19  
JOURNAL NUMBER: S0532BBG  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

...ABSTRACT: recognition method we have proposed permit the template to be deformed to a certain extent. The evaluation function is defined by the summation of the distance between deformed template and unknown pattern and the degree of deformation of template. The deformation is separated into global deformation and local deformation. Global deformation...

DESCRIPTORS: handwritten character recognition ; ...

... curve fitting...

... spline function

...BROADER DESCRIPTORS: figure pattern recognition ;

First Hit

☐  

L9: Entry 7 of 16

File: TDBD

Aug 1, 1991

DOCUMENT-IDENTIFIER: NN9108129

TITLE: Improved Quantization of Direction Angle and Angle Change Parameters in Online Handwriting Recognition.

Disclosure Text (1):

- Many online handwriting recognition systems use elastic curve matching to match an unknown character against prototype (template) characters (1). The accuracy of these recognizers depends on the distance metric used in matching. The memory required to store prototypes is proportional to the length of the writing of a character (in number of points) and the storage required for the parameters of a point. - Disclosed here is an improved quantization of the direction-angle and angle-change parameters used in the distance metric. The metric distance, described in detail in been2|, between point i in the unknown and point j in prototype k is where the first two terms are the Euclidean distance, the third term is a constant (empirically determined) times the direction-angle difference, and the fourth term is a constant (empirically determined) times the difference of the change in direction angle. - In order to reduce the storage requirements for prototypes the direction-angle and angle-change parameters were quantized to fit into 8-bit integers in the range 0-255. Storage for the direction-angle and angle-change parameters was halved, from 16-bit numbers to 8-bit numbers, without loss in recognition accuracy. In order to maintain accuracy, it was necessary to retain the 16-bit representation for the x and y offsets from the center of gravity. - References (1) C. C. Tappert, C. Y. Suen, and T. Wakahara, "The state of the art in on-line handwriting recognition," IEEE Trans . Pattern Analysis and Machine Intelligence 12, 787-808 (August 1990). (2) "Optimal Point-to-Point Distance Metric for Elastic Matching in Online Character Recognition," IBM Technical Disclosure Bulletin 33, 372 (April 1991).

File 9:Business & Industry(R) Jul/1994-2004/Mar 12  
     (c) 2004 Resp. DB Svcs.  
 File 15:ABI/Inform(R) 1971-2004/Mar 15  
     (c) 2004 ProQuest Info&Learning  
 File 16:Gale Group PROMT(R) 1990-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 20:Dialog Global Reporter 1997-2004/Mar 15  
     (c) 2004 The Dialog Corp.  
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     (c) 2004 The Gale group  
 File 75:TGG Management Contents(R) 86-2004/Mar W1  
     (c) 2004 The Gale Group  
 File 80:TGG Aerospace/Def.Mkts(R) 1986-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 88:Gale Group Business A.R.T.S. 1976-2004/Mar 12  
     (c) 2004 The Gale Group  
 File 98:General Sci Abs/Full-Text 1984-2004/Feb  
     (c) 2004 The HW Wilson Co.  
 File 112:UBM Industry News 1998-2004/Jan 27  
     (c) 2004 United Business Media  
 File 141:Readers Guide 1983-2004/Feb  
     (c) 2004 The HW Wilson Co  
 File 148:Gale Group Trade & Industry DB 1976-2004/Mar 09  
     (c)2004 The Gale Group  
 File 160:Gale Group PROMT(R) 1972-1989  
     (c) 1999 The Gale Group  
 File 275:Gale Group Computer DB(TM) 1983-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 264:DIALOG Defense Newsletters 1989-2004/Mar 15  
     (c) 2004 The Dialog Corp.  
 File 369:New Scientist 1994-2004/Mar W1  
     (c) 2004 Reed Business Information Ltd.  
 File 484:Periodical Abs Plustext 1986-2004/Mar W1  
     (c) 2004 ProQuest  
 File 553:Wilson Bus. Abs. FullText 1982-2004/Feb  
     (c) 2004 The HW Wilson Co  
 File 570:Gale Group MARS(R) 1984-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 608:KR/T Bus.News. 1992-2004/Mar 15  
     (c)2004 Knight Ridder/Tribune Bus News  
 File 620:EIU:Viewswire 2004/Mar 12  
     (c) 2004 Economist Intelligence Unit  
 File 613:PR Newswire 1999-2004/Mar 15  
     (c) 2004 PR Newswire Association Inc  
 File 621:Gale Group New Prod.Annou.(R) 1985-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 623:Business Week 1985-2004/Mar 12  
     (c) 2004 The McGraw-Hill Companies Inc  
 File 624:McGraw-Hill Publications 1985-2004/Mar 15  
     (c) 2004 McGraw-Hill Co. Inc  
 File 634:San Jose Mercury Jun 1985-2004/Mar 13  
     (c) 2004 San Jose Mercury News  
 File 635:Business Dateline(R) 1985-2004/Mar 13  
     (c) 2004 ProQuest Info&Learning  
 File 636:Gale Group Newsletter DB(TM) 1987-2004/Mar 15  
     (c) 2004 The Gale Group  
 File 647:CMP Computer Fulltext 1988-2004/Mar W1  
     (c) 2004 CMP Media, LLC  
 File 674:Computer News Fulltext 1989-2004/Mar W1  
     (c) 2004 IDG Communications  
 File 810:Business Wire 1986-1999/Feb 28



(c) 1999 Business Wire  
File 813:PR Newswire 1987-1999/Apr 30  
(c) 1999 PR Newswire Association Inc

| Set | Items  | Description  |
|-----|--------|--|
| S1  | 27898  | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FINDING OR FINDS) (3N) (SCRIBBL? OR SCRAWL??? OR CACOGRAPH? OR HANDDRAW? OR GRAFFITI OR HANDWRIT? OR (HAND OR SCRATCH?) (3N) (DRAW? OR WRIT?)) |
| S2  | 382256 | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FINDING OR FINDS) (3N) (SHAPE? ? OR FORM? ? OR FIGURE? ? OR POSTURE?? OR STRUCTUR?)  |
| S3  | 76498  | (DISTANC? OR LENGTH? OR CLOSENESS OR PROXIMIT? OR LOCATION? ? OR PLACEMENT?) (3N) (POINT? ? OR TARGET? ? OR DOT OR DOTS OR SPOT OR SPOTS)  |
| S4  | 87     | (THRESHOLD? ? OR PREDETERMIN? OR PRE()DETERMIN?) (3N) S3   |
| S5  | 712    | S1(S) S2   |
| S6  | 0      | S5(S) S4   |
| S7  | 0      | S5(S) S3   |
| S8  | 55     | S5(S) (POINT? ? OR TARGET? ? OR DOT OR DOTS OR SPOT OR SPOTS)  |
| S9  | 0      | S8(S) (CURVE? ? OR ARC OR ARCH? ? OR BEND OR BENDS OR CURL OR CURLS OR TRAJECTOR? OR SPLINE)   |
| S10 | 12     | S8(S) (STRAIGHT? OR LINE? ? OR ALIGN? OR UNBENT OR UNCURL OR UN() S9)  |
| S11 | 9      | RD S10 (unique items)  |
| S12 | 5      | S11 NOT PY>2001  |
| S13 | 6      | S1(S) S3   |
| S14 | 3      | RD S13 (unique items)  |
| S15 | 5      | S13 NOT (S12 OR PY>2001)   |
| S16 | 1      | AU=(GOLDFOOT, J? OR GOLDFOOT J?)   |
| S17 | 0      | S16 NOT INTERNET()ADMINISTRATION   |

12/3,K/1 (Item 1 from file: 15)  
DIALOG(R)File 15:ABI/Inform(R)  
(c) 2004 ProQuest Info&Learning. All rts. reserv.

00583968 91-58315  
By Hand, by Jove  
Gooding, Judson  
Across the Board v28n12 PP: 43-47 Dec 1991  
ISSN: 0147-1554 JRNL CODE: CBR  
WORD COUNT: 3490

...TEXT: tells you something; if you see a handwritten note or letter, that, too, carries some information about the writer."

An extreme example will make the point. Suppose that two candidates for a job submit handwritten letters. One applicant's letter is a neatly written document with well-formed letters, regular margins, and straight lines across the page, while the other's is a rambling, messy scrawl. The employer is bound to believe he has a strong indication of which applicant is likely to do better work. He has just used a rudimentary form of handwriting analysis.

French personnel executives, however strongly they may believe in graphology, almost invariably register one caveat: They don't rely on graphology alone. They stress that...

12/3,K/2 (Item 1 from file: 47)  
DIALOG(R)File 47:Gale Group Magazine DB(TM)  
(c) 2004 The Gale group. All rts. reserv.

03781278 SUPPLIER NUMBER: 12335066 (USE FORMAT 7 OR 9 FOR FULL TEXT)  
Newton's world. (Apple Computer Inc.'s Newton technology and personal digital assistants will lead palm-sized personal electronics revolution)(includes related article on how personal digital assistant works) (Sneak Preview)

Ito, Russell  
MacUser, v8, n8, p45(4)  
August, 1992  
ISSN: 0884-0997 LANGUAGE: ENGLISH RECORD TYPE: FULLTEXT; ABSTRACT  
WORD COUNT: 2803 LINE COUNT: 00213

... that make it unique: recognition algorithms for text and graphics, the system's intelligence and software agents, forms, and a multitasking architecture.

Newt/OS' free-form handwriting - recognition algorithm is significantly different from other handwriting - recognition systems you may have encountered. If you've seen demonstrations of pen-based systems from companies such as GO, you may be surprised to find...GO OS, however, Newt/OS supports only printed characters, although Apple maintains that cursive-writing recognition is on the way. Because Newt/OS supports free-form recognition, it can automatically align whatever you write (assuming you've written your letters on something that more or less resembles a line). It can also pick a point size that approximates your writing size and can remember the position, including the angle, of each line of writing particularly useful when you're annotating a sketched map or graphic.

Apple claims that you don't have to train the PDA to...

12/3,K/3 (Item 2 from file: 47)  
DIALOG(R)File 47:Gale Group Magazine DB(TM)  
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02870460 SUPPLIER NUMBER: 04421950 (USE FORMAT 7 OR 9 FOR FULL TEXT)  
Where pelicans kiss seals; in the surprising world of children's art,  
delightful images and original rules are created to represent the world.  
(includes related article on gifted children as artists)  
Winner, Ellen  
Psychology Today, v20, p24(7)  
Aug, 1986  
CODEN: PSTOA ISSN: 0033-3107 LANGUAGE: ENGLISH RECORD TYPE:  
FULLTEXT  
WORD COUNT: 3234 LINE COUNT: 00244

... we already see glimmerings of the idea that marks on a page can  
stand for things in the world.

Two-year-olds rarely spontaneously create recognizable forms in  
their scribbles, but they have the latent ability to do so. When Wolf or  
Fucigna dictated to 2-year-olds a list of features (head, tummy, arms,  
legs), these children plotted the features systematically on the page,  
placing them in correct relative positions (Figure 2). But they lacked the  
notion that a line stands for the edge of an object and had no way to  
represent parts of features, since each feature was either a point or a  
patch. The children clearly understood, however, that marks on a surface  
can be used to stand for features "out there," off the page...

12/3,K/4 (Item 1 from file: 88)  
DIALOG(R)File 88:Gale Group Business A.R.T.S.  
(c) 2004 The Gale Group. All rts. reserv.

04153451 SUPPLIER NUMBER: 19009697  
Copyright and a democratic civil society.  
Netanel, Neil Weinstock  
Yale Law Journal, 106, n2, 283-387  
Nov, 1996  
ISSN: 0044-0094 LANGUAGE: English RECORD TYPE: Fulltext; Abstract  
WORD COUNT: 64816 LINE COUNT: 05369

... Gordon presented the neoclassicist approach in an early article on  
copyright's fair use defense. See Wendy J. Gordon, Fair Use as Market  
Failure: A Structural and Economic Analysis of the Betamax Case and its  
Predecessors, 82 Colum. L. Rev. 1600 1605 (1982) (hereinafter Gordon, Fair  
Use). To a limited extent in that article...to limit copyright to its  
original parameters would be to consign it to oblivion. (34.) A. See, e.g.,  
Religious Tech. Ctr. v. Netcom On- Line Communication Servs., 907 F. Supp.  
1361 (N.D. Cal. 1995). (35.) Salinger was successful. See Salinger v.  
Random House, Inc., 811 F.2d 90 (2d...use that is proposed will not  
interfere with their development plans or run contrary to their views.  
(43.) Even from a completely atomistic, self-interested point of view,  
individuals benefit from democracy, because democratic government is  
generally a better guarantee of individual autonomy and freedom from  
oppression than are other forms...

...whether the benefits of transformative expression (or, for that matter,  
of copyright as a whole) are seen as irreducibly social goods or  
intractable externalities. The point in either case is that market  
transactions in a broad, proprietary copyright cannot be relied upon to

further or reflect the public interest in expressive...ON COPYRIGHT (section) 13.05(E), at 13-253 (1995) (hereinafter NIMMER ON COPYRIGHT) (recognizing that court might be impelled by "force of custom" to find that personal, handwritten copy would constitute noninfringing fair use, but arguing that such result could "not be reconciled with the rationale for fair use"). Under the "first sale...expression Dichotomy and Copyright in a Work's "Total Concept and Feel", 38 Emory L.J. 393 (1989). (82.) As Judge Learned Hand said, the line between idea and expression "wherever it is drawn, will seem arbitrary." Nichols v. Universal Pictures Corp., 45 F.2d 119, 122 (2d Cir. 1930). As...

12/3,K/5 (Item 1 from file: 647)  
DIALOG(R)File 647:CMP Computer Fulltext  
(c) 2004 CMP Media, LLC. All rts. reserv.

00549599 CMP ACCESSION NUMBER: WIN19930401S7964  
Teleform - Direct Data Entry Via Fax  
James E. Powell  
WINDOWS MAGAZINE, 1993, n 404 , 118  
PUBLICATION DATE: 930401  
JOURNAL CODE: WIN LANGUAGE: English  
RECORD TYPE: Fulltext  
SECTION HEADING: First Impressions  
WORD COUNT: 1010

... filled in, and fields for telephone or Social Security numbers. Teleform's form designer adds a code to each form you design, so it can recognize that form when it is faxed back. It also places four black dots in the corner of the form to use as alignment marks; you place the other elements on the form. When you specify the length of a field, Teleform places the right number of boxes on the form for responders to print their entry. To improve the accuracy of its handwriting recognition, you specify the type of data for each field, such as alphanumeric or numeric. You can also create fill-in-the-dot multiple-choice answers.

Teleform lets you set confidence levels for each field, and places incoming forms into the suspense queue if a field doesn't...  
?

15/3,K/1 (Item 1 from file: 47)  
DIALOG(R)File 47:Gale Group Magazine DB(TM)  
(c) 2004 The Gale group. All rts. reserv.

03885797 SUPPLIER NUMBER: 13720630 (USE FORMAT 7 OR 9 FOR FULL TEXT)  
Precision input. (includes highlights of evaluations and related articles  
on Editors' Choice products, large-format digitizers, pen computers and  
pressure-sensitive digitizing tablets) (Hardware Review) (overview of 11  
evaluations of digitizing tablets) (Evaluation)

Miller, Rock

PC Magazine, v12, n10, p259(17)

May 25, 1993

DOCUMENT TYPE: Evaluation ISSN: 0888-8507 LANGUAGE: ENGLISH

RECORD TYPE: FULLTEXT; ABSTRACT

WORD COUNT: 4551 LINE COUNT: 00356

... surface off the screen, a pen computer's aim is to make the screen  
itself a working surface. Digitizer tablets let your system read the  
location of points very precisely. But with a pen PC, the direction and  
intensity of the strokes are what matter most since these form the basis of  
the "gestures" that pen-computer operating systems interpret to control  
software and recognize handwriting .

Making a digitizer work in a portable-pen environment thus requires a  
few changes. For instance, conventional electromagnetic tablets are based  
on a grid of...

15/3,K/2 (Item 1 from file: 88)  
DIALOG(R)File 88:Gale Group Business A.R.T.S.  
(c) 2004 The Gale Group. All rts. reserv.

03177390 SUPPLIER NUMBER: 13720630  
Precision input. (includes highlights of evaluations and related articles  
on Editors' Choice products, large-format digitizers, pen computers and  
pressure-sensitive digitizing tablets) (Hardware Review) (overview of 11  
evaluations of digitizing tablets) (Evaluation)

Miller, Rock

PC Magazine, v12, n10, p259(17)

May 25, 1993

DOCUMENT TYPE: Evaluation ISSN: 0888-8507 LANGUAGE: English

RECORD TYPE: Fulltext; Abstract

WORD COUNT: 4382 LINE COUNT: 00356

... surface off the screen, a pen computer's aim is to make the screen  
itself a working surface. Digitizer tablets let your system read the  
location of points very precisely. But with a pen PC, the direction and  
intensity of the strokes are what matter most since these form the basis of  
the "gestures" that pen-computer operating systems interpret to control  
software and recognize handwriting .

Making a digitizer work in a portable-pen environment thus requires a  
few changes. For instance, conventional electromagnetic tablets are based  
on a grid of...

15/3,K/3 (Item 1 from file: 148)  
DIALOG(R)File 148:Gale Group Trade & Industry DB  
(c)2004 The Gale Group. All rts. reserv.

08121230 SUPPLIER NUMBER: 17379807 (USE FORMAT 7 OR 9 FOR FULL TEXT)

**Recurrent fuzzy logic for context-dependent applications.**

Khan, Emdad

Electronic Design, v43, n16, p72(1)

August 7, 1995

ISSN: 0013-4872

LANGUAGE: English

RECORD TYPE: Fulltext; Abstract

WORD COUNT: 936

LINE COUNT: 00076

... embedded in each point of the cursive writing that can be used to determine what has been written in the recent past and predict the location of the next point, and ultimately recognize the letter (or segment of the letter).

As the pen moves, information contained in the pen velocity and curve relate to both...

15/3,K/4 (Item 2 from file: 148)

DIALOG(R)File 148:Gale Group Trade & Industry DB

(c)2004 The Gale Group. All rts. reserv.

06452512 SUPPLIER NUMBER: 13720630 (USE FORMAT 7 OR 9 FOR FULL TEXT)

Precision input. (includes highlights of evaluations and related articles on Editors' Choice products, large-format digitizers, pen computers and pressure-sensitive digitizing tablets) (Hardware Review) (overview of 11 evaluations of digitizing tablets) (Evaluation)

Miller, Rock

PC Magazine, v12, n10, p259(17)

May 25, 1993

DOCUMENT TYPE: Evaluation

ISSN: 0888-8507

LANGUAGE: ENGLISH

RECORD TYPE: FULLTEXT; ABSTRACT

WORD COUNT: 4551

LINE COUNT: 00356

... of the strokes are what matter most since these form the basis of the "gestures" that pen-computer operating systems interpret to control software and recognize handwriting.

Making a digitizer work in a portable-pen environment thus requires a few changes. For instance, conventional electromagnetic tablets are based on a grid of...

15/3,K/5 (Item 1 from file: 275)

DIALOG(R)File 275:Gale Group Computer DB(TM)

(c) 2004 The Gale Group. All rts. reserv.

01597166 SUPPLIER NUMBER: 13720630 (USE FORMAT 7 OR 9 FOR FULL TEXT)

Precision input. (includes highlights of evaluations and related articles on Editors' Choice products, large-format digitizers, pen computers and pressure-sensitive digitizing tablets) (Hardware Review) (overview of 11 evaluations of digitizing tablets) (Evaluation)

Miller, Rock

PC Magazine, v12, n10, p259(17)

May 25, 1993

DOCUMENT TYPE: Evaluation

ISSN: 0888-8507

LANGUAGE: ENGLISH

RECORD TYPE: FULLTEXT; ABSTRACT

WORD COUNT: 4551

LINE COUNT: 00356

... surface off the screen, a pen computer's aim is to make the screen itself a working surface. Digitizer tablets let your system read the location of points very precisely. But with a pen PC, the direction and intensity of the strokes are what matter most since these form the basis of the "gestures" that pen-computer operating systems interpret to control

software and **recognize** **handwriting** .

Making a digitizer work in a portable-pen environment thus requires a few changes. For instance, conventional electromagnetic tablets are based on a grid of...

?

File 348:EUROPEAN PATENTS 1978-2004/Mar W01

(c) 2004 European Patent Office

File 349:PCT FULLTEXT 1979-2002/UB=20040311,UT=20040304

(c) 2004 WIPO/Univentio

| Set | Items   | Description  |
|-----|---------|--|
| S1  | 1640834 | SHAPE? ? OR FORM? ? OR FIGURE? ? OR POSTURE?? OR STRUCTUR?   |
| S2  | 10173   | SCRIBBL? OR SCRAWL??? OR CACOGRAPH? OR HANDDRAW? OR GRAFFI-<br>TI OR HANDWRIT? OR (HAND OR SCRATCH?) (3N) (DRAW? OR WRIT?) |
| S3  | 1814    | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N)S2                                      |
| S4  | 120132  | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N)S1                                      |
| S5  | 895807  | (POINT? ? OR TARGET? ? OR DOT OR DOTS OR SPOT OR SPOTS)  |
| S6  | 833715  | DISTANC? OR LENGTH? OR CLOSENESS OR PROXIMIT? OR (LOCATION?<br>? OR PLACEMENT?) (3N)S5                                     |
| S7  | 56389   | (THRESHOLD? ? OR PREDETERMIN? OR PRE()DETERMIN?) (3N)S6  |
| S8  | 373818  | CURVE? ? OR ARC OR ARCH? ? OR BEND OR BENDS OR CURL OR CUR-<br>LS OR TRAJECTOR? OR SPLINE                                  |
| S9  | 937235  | STRAIGHT? OR LINE? ? OR ALIGN? OR UNBENT OR UNCURLD OR UN-<br>( )S8  |
| S10 | 138     | S3(S)S4  |
| S11 | 0       | S10(S)S7   |
| S12 | 17      | S10(S)S6   |
| S13 | 7       | S12(S) (S8 OR S9)  |
| S14 | 7       | IDPAT (sorted in duplicate/non-duplicate order)  |
| S15 | 7       | IDPAT (primary/non-duplicate records only)   |
| S16 | 25      | S10(S)S5   |
| S17 | 2       | S16(S)S8(S)S9  |
| S18 | 1       | S17 NOT S15  |
| S19 | 10      | S16(S) (S8 OR S9)  |
| S20 | 5       | S19 NOT (S15 OR S18)   |
| S21 | 27      | S12 OR S16 NOT (S15 OR S18 OR S20)   |
| S22 | 2       | S21 AND IC=(G06K-009/00 OR G06K-009/46)  |
| S23 | 11      | S21 AND IC=(G06K OR G06K)  |
| S24 | 11      | IDPAT (sorted in duplicate/non-duplicate order)  |
| S25 | 11      | IDPAT (primary/non-duplicate records only)   |



15/3,K/1 (Item 1 from file: 348)  
DIALOG(R) File 348:EUROPEAN PATENTS  
(c) 2004 European Patent Office. All rts. reserv.

01637042

Similarity measure for pattern recognition

Ahnlichkeitsmass fur die Mustererkennung

Mesure de similitude pour la reconnaissance de forme

PATENT ASSIGNEE:

Entropy Software Laboratory, Inc., (3866300), 2217-15, Hayashicho,  
Takamatsu-shi, Kagawa, (JP), (Applicant designated States: all)

INVENTOR:

Jinnai, Michihiro, 2304-17, Yashimanishimachi, Takamatsu-shi, Kagawa,  
(JP)

LEGAL REPRESENTATIVE:

Strehl Schubel-Hopf & Partner (100941), Maximilianstrasse 54, 80538  
Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 1349144 A2 031001 (Basic)

APPLICATION (CC, No, Date): EP 2003005733 030313;

PRIORITY (CC, No, Date): JP 200268231 020313

DESIGNATED STATES: AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES; FI; FR; GB; GR;  
HU; IE; IT; LI; LU; MC; NL; PT; RO; SE; SI; SK; TR

EXTENDED DESIGNATED STATES: AL; LT; LV; MK; RO

INTERNATIONAL PATENT CLASS: G10L-015/10; G06K-009/64

ABSTRACT WORD COUNT: 178

NOTE:

Figure number on first page: 21

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS A                           | (English) | 200340 | 4570       |
| SPEC A                             | (English) | 200340 | 71799      |
| Total word count - document A      |           |        | 76369      |
| Total word count - document B      |           |        | 0          |
| Total word count - documents A + B |           |        | 76369      |

...SPECIFICATION on the (x-y) normalized plane three-dimensionally.

FIG. 18 is a diagram showing a change example of a value of variance of the normal **curve** and a change example of a **length** between the center of the normal **curve** and a point (i1), i2))) when the center of the normal **curve** is moved.

FIG. 19 is a diagram showing a change example of the weighting **curve** and a change example of a **length** between the center of the weighting **curve** and the point (i1), i2))) when the center of the weighting **curve** is moved.

FIG. 20 is a diagram showing a relationship among a point of a weighted standard pattern matrix, a point of a weighted input...change rates of kurtoses of the normal curves.

FIG. 47 is a graph showing a change in a ratio value of mean values of geometric **distances** calculated by use of the weighting **curves** created based on the change rates of the kurtoses of the normal **curves**.

FIG. 48 is a graph showing a change in a difference value of the mean values of the geometric **distances** calculated by use of the weighting **curves** created based on the change rates of the kurtoses of the normal **curves**.

FIG. 49 is a diagram showing change examples of weighting curves created based on cosine functions.

FIG. 50 is a graph showing a change in a ratio value of mean values of

15/3,K/2 (Item 2 from file: 348)  
DIALOG(R)File 348:EUROPEAN PATENTS  
(c) 2004 European Patent Office. All rts. reserv.

00603562

Text recognition

Texterkennung

Reconnaissance de texte

PATENT ASSIGNEE:

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Proprietor designated states: all)

INVENTOR:

Chen, Francine R., 975 Sherman Avenue, Menlo Park, California 94025, (US)  
Wilcox, Lynn D., 45 Joaquin Road, Portola Valley, California 94028, (US)

LEGAL REPRESENTATIVE:

Grunecker, Kinkeldey, Stockmair & Schwanhausser Anwaltssozietat (100721)  
, Maximilianstrasse 58, 80538 Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 602956 A2 940622 (Basic)

EP 602956 A3 950118

EP 602956 B1 000830

APPLICATION (CC, No, Date): EP 93310137 931215;

PRIORITY (CC, No, Date): US 991911 921217

DESIGNATED STATES: DE; FR; GB

INTERNATIONAL PATENT CLASS: G06K-009/68

ABSTRACT WORD COUNT: 208

NOTE:

Figure number on first page: 12B

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200035 | 959        |
| CLAIMS B                           | (German)  | 200035 | 926        |
| CLAIMS B                           | (French)  | 200035 | 1230       |
| SPEC B                             | (English) | 200035 | 12216      |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 15331      |
| Total word count - documents A + B |           |        | 15331      |

15/3,K/3 (Item 3 from file: 348)  
DIALOG(R)File 348:EUROPEAN PATENTS  
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00603559

Text recognition

Texterkennung

Reconnaissance de texte

PATENT ASSIGNEE:

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Proprietor designated states: all)

INVENTOR:

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Bloomberg, Dan S., 1013 Paradise Way, Palo Alto, California 94306, (US)

LEGAL REPRESENTATIVE:

Grunecker, Kinkeldey, Stockmair & Schwanhausser Anwaltssozietat (100721)  
, Maximilianstrasse 58, 80538 Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 602955 A2 940622 (Basic)

EP 602955 A3 950118

EP 602955 B1 001227  
APPLICATION (CC, No, Date): EP 93310134 931215;  
PRIORITY (CC, No, Date): US 991913 921217; US 992358 921217  
DESIGNATED STATES: DE; FR; GB  
INTERNATIONAL PATENT CLASS: G06K-009/68  
ABSTRACT WORD COUNT: 208  
NOTE:

Figure number on first page: 2

LANGUAGE (Publication,Procedural,Application): English; English; English  
FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200052 | 727        |
| CLAIMS B                           | (German)  | 200052 | 695        |
| CLAIMS B                           | (French)  | 200052 | 856        |
| SPEC B                             | (English) | 200052 | 12095      |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 14373      |
| Total word count - documents A + B |           |        | 14373      |

15/3,K/4 (Item 4 from file: 348)  
DIALOG(R) File 348:EUROPEAN PATENTS  
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00578720

Method for deriving character features in a character recognition system  
Verfahren zum Ableiten der Merkmale von Zeichen in einem  
Zeichenerkennungssystem

Methode pour deriver des caracteristiques de caracteres dans un systeme de  
reconnaissance de caracteres

PATENT ASSIGNEE:

Koninklijke KPN N.V., (1066890), Stationsplein 7, 9726 AE Groningen,  
(NL), (Proprietor designated states: all)

INVENTOR:

Wilcke, Robert, Spinozaweg 9, NL-2202 AV Noordwijk, (NL)

PATENT (CC, No, Kind, Date): EP 604687 A1 940706 (Basic)  
EP 604687 B1 000419

APPLICATION (CC, No, Date): EP 92204106 921230;  
PRIORITY (CC, No, Date): EP 92204106 921230  
DESIGNATED STATES: AT; BE; CH; DE; DK; ES; FR; GB; GR; IE; IT; LI; LU; NL;  
PT; SE

INTERNATIONAL PATENT CLASS: G06K-009/48  
ABSTRACT WORD COUNT: 179

NOTE:

Figure number on first page: 4

LANGUAGE (Publication,Procedural,Application): English; English; Dutch  
FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200016 | 504        |
| CLAIMS B                           | (German)  | 200016 | 478        |
| CLAIMS B                           | (French)  | 200016 | 597        |
| SPEC B                             | (English) | 200016 | 5576       |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 7155       |
| Total word count - documents A + B |           |        | 7155       |

15/3,K/5 (Item 5 from file: 349)  
DIALOG(R) File 349:PCT FULLTEXT

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01093644      \*\*Image available\*\*

**VERTICAL SYSTEM INTEGRATION**  
**INTEGRATION DE SYSTEME VERTICALE**

Patent Applicant/Inventor:

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Legal Representative:

MUIR Michael (agent), P.O. Box 2187, Cupertino, CA 95015-2187, US,

Patent and Priority Information (Country, Number, Date):

Patent: WO 200415764 A2 20040219 (WO 0415764)

Application: WO 2003US25048 20030808 (PCT/WO US03025048)

Priority Application: US 2002402112 20020808

Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ  
DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ  
LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG  
SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZM ZW  
(EP) AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL PT RO SE  
SI SK TR

(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG

(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW

(EA) AM AZ BY KG KZ MD RU TJ TM

Publication Language: English

Filing Language: English

Fulltext Word Count: 83697

Fulltext Availability:

Detailed Description

Detailed Description

15/3,K/6      (Item 6 from file: 349)

DIALOG(R)File 349:PCT FULLTEXT

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01004323      \*\*Image available\*\*

**CHARACTER IDENTIFICATION**  
**IDENTIFICATION DE CARACTERES**

Patent Applicant/Assignee:

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Wales 2041, AU, AU (Residence), AU (Nationality), (For all designated  
states except: US)

Patent Applicant/Inventor:

NAPPER Jonathon Leigh, Silverbrook Research Pty Ltd, 393 Darling Street,  
Balmain, New South Wales 2041, AU, AU (Residence), AU (Nationality),  
(Designated only for: US)

Legal Representative:

SILVERBROOK Kia (agent), Silverbrook Research Pty Ltd, 393 Darling  
Street, Balmain, New South Wales 2041, AU,

Patent and Priority Information (Country, Number, Date):

Patent: WO 200334317 A1 20030424 (WO 0334317)

Application: WO 2002AU1394 20021015 (PCT/WO AU0201394)

Priority Application: AU 20018244 20011015

Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU  
CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP  
KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO  
RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
(EP) AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LU MC NL PT SE SK TR  
(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG

(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW  
(EA) AM AZ BY KG KZ MD RU TJ TM  
Publication Language: English  
Filing Language: English  
Fulltext Word Count: 8548

Fulltext Availability:  
Claims

#### Claim

... classifier supports many letter classes, a class supports many allographs, and an allograph may support many prototypes. In this procedure, classification proceeds by calculating the **distance** between each prototype vector and the input feature vector in the feature space. This **distance** represents the similarity between the feature vector and the prototype vector, and hence the similarity between the character and a respective prototype. The processor 20 then determines the class of the prototype in accordance with the minimum **distance** as the label of the input data. Thus, the processor 20 determines the prototype vector separated from the feature vector by the minimum **distance** value and uses this to determine the letter represented by the character. In order to support the writer-specific determination of allographs, the **distance** value for ... weighting factor depending on its allograph type. Thus allographs with higher weights are less likely to be matched, since the higher weighting will increase the **distance** metric, so decreasing a weight increases the probability that an allograph will be matched; increasing the weight decreases the probability of a match. Initially all ...

...1), indicating that no writer-specific preference is given to an allograph. At this point the classification scheme is independent. Adding in the weighting, the **distance** value is calculated for a Euclidean-**distance** nearest neighbour classifier as follows:

$$n$$
$$6(x) = \arg \min(D_i(x))$$
$$i=1$$
$$D_j(x) = w_i \times ||x - y_j||$$

Where:  $y_j$  is the... in Figure 6. In particular, in this example, as the weight for the class 3 is decreased, this pushes the original decision boundary 5 (solid line) toward the class 4 forming a new decision boundary 6 (dashed line) that gives a higher probability of matching class 3 over class 4. The simple weight adaptation procedure described above can suffer from a number of problems. In particular, a number of allographs might match almost equally (ie. there is only a very small difference between the **distances** to two different allographs from the feature vector) indicating there is no strong evidence of one allograph being used in preference to the other. Conversely unused allographs are quickly identified and deprioritised. Thus, the weight updating should compare the minimum **distances** of the allograph groups (ie. the **distances** of the best matching prototype for each allograph) and update the weights proportionally to these values. In this way, the allographs are made to compete with one another, since the **distance** results of each allograph have an impact on the weight modification made to the remaining allographs. To implement this kind of weight updating, the processor prototype that most closely resembles the character. Once this has been performed, the processor 20 operates to determine a minimum **distance** for each allograph group in the class. This is achieved by determining the **distance** between the feature vector and the closest prototype vector for each allograph group. The processor 20 then

determines the mean of the minimum distances for the allographs in the class, and uses this to update each weighting. In particular, the weighting modification for a particular allograph is based on the difference between the allograph's minimum distance and the mean distance. To ensure that very large distances do not produce very large changes to the mean, all distances are converted to an exponential form, as follows.

for each allograph  $i$  within the matched class

```

n
Mi = argmin(Dj)
Ej = e-Mi,
n
YE,
E=
n
Wj=Wj+nX(E-Ej)

```

where:  $n$  is the learning rate parameter. Using this procedure, allographs with minimum distances below the mean distance will have larger values of  $E_j$  (since  $e^0 = 1$  and  $\lim_{x \rightarrow \infty} e^{-x} = 0$ ) resulting in negative updates to the allograph weight since the mean will be less than  $E_j$ . The greater  $E_j$  is above the mean distance, the greater the weight update. Thus, poorly matched allographs will be updated with positive weight increment depending on how small  $E_j$  is compared to the mean. Further, ambiguous results (where minimum allograph distances do not differ significantly) will produce very small weight updates, since all distances will not lie far from the mean. The procedure described above is automatic and therefore requires not intervention from the user. In particular, the process...above- described process provides a procedure for the competitive learning of letter allographs. This adaptive learning process is able to improve the accuracy of a handwritten character recognition system by minimising the recognition probability of letter allographs that are not used by a specific writer. A number of weight adaptation mechanisms are described...number of users. This can be used, for example in a network based environment, such as the Internet, to allow a single processing system to analyse handwriting submitted from ...the character, the feature vector being formed from a number of values, each value quantifying a respective feature of the character; and,

b) Determining a distance value representing the distance between the feature vector and the respective prototype vector. 8) A method according to any one of the claims 1 to 7, each allograph ...or more of the allographs. 9) A method according to claim 7 and claim 8, the selection value being determined in accordance with the determined distance value and the weighting associated with the respective allograph. 10) A method according to claim 8 or claim 9, the method including modifying the weighting...to claim 12, when dependent on claim 7, the method including:

- a) Selecting a reference prototype for each allograph to be modified;
- b) Determining the distance value for each reference prototype;
- c) Determining an average of the determined distance values; and,
- d) Modifying the weighting of each allograph in accordance with the distance value of the respective reference prototype and the average distance value. 15) A method according to claim 14, the reference prototype being the prototype having the lowest distance value for the respective allograph. 16) A method according to any one of claims 1 to 14, the method being performed using a processing ...representing the character, the feature vector being formed from a number of values, each value quantifying a respective feature of the character;

b) Determining a **distance** value representing the **distance** between the feature vector and the respective prototype vector; and,  
c) Determining the selection value in accordance with the determined **distance** value and the weighting associated with the respective allograph. 24) A method according

15/3,K/7 (Item 7 from file: 349)  
DIALOG(R) File 349:PCT FULLTEXT  
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00514167

**FLEET MANAGEMENT SYSTEM AND METHOD**  
**SYSTEME ET PROCEDE DE GESTION DE PARC AUTOMOBILE**

Patent Applicant/Assignee:

MOBILE INFORMATION SYSTEM INC,

Inventor(s):

PRABHAKARAN Sanjiv,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9945519 A2 19990910

Application: WO 99US4931 19990305 (PCT/WO US9904931)

Priority Application: US 9836094 19980306

Designated States: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES

FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU

LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT UA

UG UZ VN YU ZW GH GM KE LS MW SD SL SZ UG ZW AM AZ BY KG KZ MD RU TJ TM

AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE BF BJ CF CG CI CM

GA GN GW ML MR NE SN TD TG

Publication Language: English

Fulltext Word Count: 14527

Fulltext Availability:

Claims

Claim

... display 202. Alternatively, if the data entry portion receives data through writing or drawing on a display, the MDT or MCU may include circuitry to **recognize hand - writings** or signatures. This ability, for example, could assist the user in determining whether the person signing for a package has the authority to do so...palms, for example. Preferably, the housing is also made of an isolating or shielding material which can electrically isolate the internal electronics from external transmission **lines** that can lead to "noise" or multi-path influences. The housing is also chemically resistant and inert to isolate the internal components from chemical influences...

...for example, on a belt clip. Such a configuration may provide a lighter N41DT which may be carried by hand for a longer period to **distance**. The @MT is generally less than 5 pounds, less than 2.5 pounds, or less than 1 pound to merely ounces in preferred embodiments.

If...of the screen by allowing scrolling of the forms. In addition, a number of routines could support automatic list building by selecting and inserting an **identification** number in appropriate **form** field. The MI)T module may provide a recall of information that is the same from job to job, such as customer-related information, by...

...s name or other identification tools such as the identification number. Other features may include using a Menus module to support scrolling menus, time and **distance** position reporting, data compression, and

18/3,K/1 (Item 1 from file: 349)  
DIALOG(R)File 349:PCT FULLTEXT  
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00210994

**AUTOMATIC DRAWING SYSTEM**  
**SYSTEME DE DESSIN AUTOMATIQUE**

Patent Applicant/Assignee:

HOROWITZ Steven L,  
LING Marvin T,

Inventor(s):

HOROWITZ Steven L,  
LING Marvin T,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9208201 A1 19920514

Application: WO 90US6274 19901029 (PCT/WO US9006274)

Priority Application: WO 90US6274 19901029

Designated States: AT BE CH DE DK ES FR GB GR IT JP KR LU NL SE

Publication Language: English

Fulltext Word Count: 23215

Fulltext Availability:

Detailed Description

Detailed Description

... DRAWING SYSTEM

BACKGROUND OF THE INVENTION

The invention relates to computerized systems which can scan hand-drawn drawings using an optical scanner, recognize text and lines , points on arcs, circles, curves and shapes , and recognize certain hand - drawn global commands;----local commands, and spatial indicators on a "layer-by-layer" basis, and can generate progressively complete "mathematically accurate" composite drawings by means of...

?



20/3,K/1 (Item 1 from file: 348)  
DIALOG(R)File 348:EUROPEAN PATENTS  
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00160628

Method and apparatus for recognizing and displaying handwritten characters and figures.

Verfahren und Anlage zum Erkennen und Anzeigen handgeschriebener Zeichen und Figuren.

Procede et dispositif de reconnaissance et affichage de caracteres et figures manuscrites.

PATENT ASSIGNEE:

HITACHI, LTD., (204144), 6, Kanda Surugadai 4-chome, Chiyoda-ku, Tokyo 100, (JP), (applicant designated states: CH;DE;FR;GB;IT;LI;NL;SE)

INVENTOR:

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Shojima, Hiroshi, Yuhoryo, 20-3 Ayukawacho-6-chome, Hitachi-shi, (JP)  
Yokoyama, Takanori, Yuhoryo, 20-3 Ayukawacho-6-chome, Hitachi-shi, (JP)  
Koga, Kazuyoshi, Yuhoryo, 20-3 Ayukawacho-6-chome, Hitachi-shi, (JP)  
Hirasawa, Kotaro, 10-7, Kanesawacho-7-chome, Hitachi-shi, (JP)  
Kawada, Shinichi, 1382-8, Arajukucho, Hitachiota-shi, (JP)

LEGAL REPRESENTATIVE:

Patentanwalte Beetz - Timpe - Siegfried Schmitt-Fumian - Mayr (100712)  
, Steinsdorfstrasse 10, D-80538 Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 156394 A2 851002 (Basic)  
EP 156394 A3 880831  
EP 156394 B1 930714

APPLICATION (CC, No, Date): EP 85103823 850329;

PRIORITY (CC, No, Date): JP 8460717 840330

DESIGNATED STATES: CH; DE; FR; GB; IT; LI; NL; SE

INTERNATIONAL PATENT CLASS: G06K-009/22;

ABSTRACT WORD COUNT: 123

LANGUAGE (Publication,Procedural,Application): English; English; English  
FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | EPBBF1 | 516        |
| CLAIMS B                           | (German)  | EPBBF1 | 452        |
| CLAIMS B                           | (French)  | EPBBF1 | 597        |
| SPEC B                             | (English) | EPBBF1 | 3736       |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 5301       |
| Total word count - documents A + B |           |        | 5301       |

...SPECIFICATION 3, and the coordinates of input points can be read by the tablet 3. The coordinates of the input points are successively sent to the **handwritten** character and pattern **recognition** means (hereinafter simply referred to as "recognition means") 7 through a bus 101 (step A)). The recognition means 7 sends the above coordinates to the...

...a bus 102 after having subjected the coordinates to coordinate transformation, to prepare for displaying the stroke (step B). The processing means 4 writes a **straight line** connecting adjacent ones of the above coordinates in the frame memory 5 at corresponding positions thereof, to prepare for displaying the stroke on the liquid crystal display 2 (step C). While, the **recognition** means 7 performs **handwriting recognition** on the basis of the input stroke (step D). It is judged whether the input stroke agrees with a character or a figure

stored in a dictionary (not shown), or not (step E ). When the input stroke does not agree with such a character or figure , the recognition means 7 waits for the next stroke. When the input stroke agrees with such a character or figure, the character or figure, that is, the result of recognition is sent to the processing means 4 through the bus 102 (step F ). At this time, not only the character code or figure thus determined but also information on how many ones of input strokes have been used for recognition, is sent to the processing means 4, as will be ...

20/3,K/2 (Item 1 from file: 349)  
DIALOG(R)File 349:PCT FULLTEXT  
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00893330 \*\*Image available\*\*  
DRAWING, WRITING AND POINTING DEVICE  
DISPOSITIF DE DESSIN, D'ECRITURE ET DE POINTAGE  
Patent Applicant/Inventor:  
NJOLSTAD Tormod, Frode Rinnansvei 62, N-7050 Trondheim, NO, NO  
(Residence), NO (Nationality)  
Legal Representative:  
ABC-PATENT SIVILING ROLF CHR B LARSEN A S (agent), Brynsveien 5, N-0667  
Oslo, NO,  
Patent and Priority Information (Country, Number, Date):  
Patent: WO 200227461 A1 20020404 (WO 0227461)  
Application: WO 2001N0369 20010907 (PCT/WO NO0100369)  
Priority Application: NO 20004514 20000911  
Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU  
CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP  
KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PH PL PT RO RU  
SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW  
(EP) AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR  
(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG  
(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZW  
(EA) AM AZ BY KG KZ MD RU TJ TM  
Publication Language: English  
Filing Language: Norwegian  
Fulltext Word Count: 6278

Fulltext Availability:  
Claims

#### Claim

... fairly cost effective solutions, but also complete systems integrated in one silicon chip are possible in the low cost CMOS technoloav available today.  
As every line in the video image is analyzed/filtered separately the hardware (i.e. the electronics) is relatively simple. The design of the tip 2 ensures that...  
...whole code patternf see Figure 2, When selecting other code patterns for the tip of the device, the filtering of a selected area of image points , not only those along one line  
12  
at a time, may be of interest.  
The camera and recognition system 13 may also comprise means 17 for transmitting data by transmitting signals...

...i-ew-ing--f--ie@ld 31--of-the-came-ra --- 13.

In a preferable embodiment the camera and recognition system 13 is adapted to form position determining signals similar to those produced by a typical computer mouse device, and to transfer the position determining signals to a computer. In this manner all...device 1 ensures that an arbitrary user may use it naturally, intuitively and ergonomically to write in his own handwriting, to draw accurately and to point at a computer/video projection screen, such that a user can interact easily with the system to give, store, reproduce and process such handwriting, such drawings and perform commands...

...operations according to such pointing movements. The invention makes it possible with great accuracy and in a cost effective manner to draw, erase, write, and point in a virtual screen being updated by a computer. Technology for automatic analysis of handwriting may, if desired, be used to obtain further user benefits, functionality as well as individual adaptation to the system. Data presentations (with PowerPoint etc.) are...

20/3,K/3 (Item 2 from file: 349)  
DIALOG(R) File 349:PCT FULLTEXT  
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00404014 \*\*Image available\*\*

**METHODS AND APPARATUSES FOR HANDWRITING RECOGNITION**  
**PROCEDES ET APPAREILS DE RECONNAISSANCE DE L'ECRITURE MANUSCRITE**

Patent Applicant/Assignee:

APPLE COMPUTER INC,  
INSTITUTE OF SYSTEMS SCIENCE,

Inventor(s):

LOUDON Gareth H,  
WU Yi-Min,  
PITTMAN James A,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9744758 A1 19971127

Application: WO 97US8796 19970521 (PCT/WO US9708796)

Priority Application: US 96652160 19960523

Designated States: AL AM AT AU AZ BA BB BG BR BY CA CH CN CU CZ DE DK EE ES

FI GB GE HU IL IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW

MX NO NZ PL PT RO RU SD SE SG SI SK TJ TM TR TT UA UG UZ VN GH KE LS MW

SD SZ UG AM AZ BY KG KZ MD RU TJ TM AT BE CH DE DK ES FI FR GB GR IE IT

LU MC NL PT SE BF BJ CF CG CI CM GA GN ML MR NE SN TD TG

Publication Language: English

Fulltext Word Count: 11268

Fulltext Availability:

Detailed Description

Detailed Description

... indicated in step 30 of Figure 1A is generally shown in Figures 15 and 18 and is generally described in the accompanying text for these figures

The preclassification recognition is implemented by preclassifier 29 which receives the test data 28; the test data is provided to the radical sequence recognition and to the geometric...

...Analysis and Machine Intelligence, vol. 6, no. 4, pp. 386-405 (1984); and Tappert, C.C., et al., "The State of The Art In On- Line Handwriting Recognition". IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 12, no. 8, pp. 787-808, (1990). The combined probabilities from the multiple classifiers...

20/3,K/4 (Item 3 from file: 349)  
DIALOG(R)File 349:PCT FULLTEXT  
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00358786 \*\*Image available\*\*

**A REAL TIME HANDWRITING RECOGNITION SYSTEM**

**SYSTEME DE RECONNAISSANCE D'ECRITURE MANUELLE EN TEMPS REEL**

Patent Applicant/Assignee:

WANG LABORATORIES INC,

Inventor(s):

JOURJINE Alexander,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9641300 A1 19961219

Application: WO 96US4156 19960327 (PCT/WO US9604156)

Priority Application: US 95476826 19950607

Designated States: AU CA JP AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE

Publication Language: English

Fulltext Word Count: 47404

Fulltext Availability:  
Claims

**Claim**

... current stroke, wherein

136

the stroke recognition features describe the current stroke with variable degrees of hierarchical approximation, and include the direction string indicating, for **points** along the **line** of the stroke, the direction of movement of the **line** of the stroke at each **point** .

9. The handwritten character recognition system of claim 8 wherein the stroke recognition features further include:

e recognition features further include:

the coordinates of at...current stroke, wherein

the stroke recognition features describe the current stroke with variable degrees of hierarchical approximation, and include

138

the direction string indicating, for **points** along the **line** of the stroke, the direction of movement of the **line** of the stroke at each **point** .

13. The handwritten character recognition system of claim 12 wherein the stroke proportion discriminator further generates, for each ideal prototype representation, a corresponding reversed ideal...

20/3,K/5 (Item 4 from file: 349)  
DIALOG(R)File 349:PCT FULLTEXT  
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00300862    \*\*Image available\*\*

METHOD AND APPARATUS FOR INTERPRETING HANDWRITTEN SYMBOLS IN A COMPUTER  
SYSTEM

PROCEDE ET DISPOSITIF D'INTERPRETATION DE SYMBOLES DE CARACTERES MANUSCRITS  
DANS UN SYSTEME INFORMATIQUE

Patent Applicant/Assignee:

SHARPENED SOFTWARE INC,

Inventor(s):

LIBES Michael,

ADAMS William J,

LESH Neal B,

KUSHMERICK Nicholas,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9519013 A1 19950713

Application: WO 94US14980 19941229 (PCT/WO US9414980)

Priority Application: US 94178218 19940106; US 94324442 19941017

Designated States: AM AT AU BB BG BR BY CA CH CN CZ DE DK EE ES FI GB GE HU

JP KE KG KP KR KZ LK LR LT LU LV MD MG MN MW NL NO NZ PL PT RO RU SD SE

SI SK TJ TT UA UZ VN KE MW SD SZ AT BE CH DE DK ES FR GB GR IE IT LU MC

NL PT SE BF BJ CF CG CI CM GA GN ML MR NE SN TD TG

Publication Language: English

Fulltext Word Count: 15946

Fulltext Availability:

Detailed Description

Detailed Description

... a flow chart of the steps taken by the present invention to  
calculate the bounding box and to determine whether a handwritten stroke  
is a dot , a

vertical line or a horizontal line ;

FIGURE 5A is a flow chart showing the steps taken by the present  
invention to detect a line , the direction that the line was drawn,  
and whether the line is a single

line or a double line ;

FIGURES 6, 6A and 6B show how the present invention uses a grid to  
recognize shapes of the Unistroke'RM alphabet as well as additional  
strokes that can be

recognized and mapped by the present invention;

FIGURES 7A-7B are a...

?

25/5/1 (Item 1 from file: 348)  
DIALOG(R) File 348:EUROPEAN PATENTS  
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01657049

Handwriting layout analysis of freeform digital ink input  
Analyse von handgeschriebenem Layout von Freiform-Eingabe mit digitaler  
Tinte  
Analyse de mise en page d'un document manuscrit pour une entree d'encre  
digitale en forme libre

PATENT ASSIGNEE:

MICROSOFT CORPORATION, (749866), One Microsoft Way, Redmond, WA 98052,  
(US), (Applicant designated States: all)

INVENTOR:

Shilman, Michael M., 4616 Linden Ave., Seattle WA 98103, (US)  
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Beijing 100080, (CN)  
Zou, Yu 5F, Sigma Center, Zhichun Road, Haidian District Beijing 100080,  
(CN)  
Simard, Patrick F., 13126 NE 131st PL, Bellevue WA 98005, (US)  
Raghupathy, Sashi, 9705 156th Pl NE, Redmond WA 98052, (US)  
Jones, F. David, 17515 NE 38th Ct., Redmond WA 98052, (US)  
Lui, Charlton E., 6215 204th Dr. NE, Redmond WA 98052, (US)  
Wang Jian c/o Microsoft Research Asia, 5/F, Beijing, Sigma Center nr 59,  
Zhichun Road, Haidian District Beijing 100080, (CN)

LEGAL REPRESENTATIVE:

Grunecker, Kinkeldey, Stockmair & Schwanhauser Anwaltssozietat (100721)  
, Maximilianstrasse 58, 80538 Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 1363229 A2 031119 (Basic)

APPLICATION (CC, No, Date): EP 2003003755 030219;

PRIORITY (CC, No, Date): US 143865 020514

DESIGNATED STATES: AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES; FI; FR; GB; GR;  
HU; IE; IT; LI; LU; MC; NL; PT; SE; SI; SK; TR

EXTENDED DESIGNATED STATES: AL; LT; LV; MK; RO

INTERNATIONAL PATENT CLASS: G06K-009/22

ABSTRACT EP 1363229 A2

Electronic ink layout analysis systems and methods provide flexibility and efficiency in organizing, analyzing, and processing digital ink. These layout analysis systems and methods allow users substantial freedom in entering electronic ink into a pen-based computer system. Using these systems and methods, a user's input digital ink is not constrained by requirements that a user write in a specific screen orientation, that a user write in one specific orientation on all portions of a page, or that a user write using a specific minimum or maximum sized stroke. Rather, the systems and methods freely allow the user to write anywhere on a given page, in any orientation or size, while still enabling effective and efficient handwriting recognition and other processing of the input digital ink.

ABSTRACT WORD COUNT: 126

NOTE:

Figure number on first page: 1

LEGAL STATUS (Type, Pub Date, Kind, Text):

Application: 031119 A2 Published application without search report

Change: 040107 A2 Inventor information changed: 20031121

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text | Language  | Update | Word Count |
|----------------|-----------|--------|------------|
| CLAIMS A       | (English) | 200347 | 2750       |

SPEC A (English) 200347 14084  
Total word count - document A 16834  
Total word count - document B 0  
Total word count - documents A + B 16834

25/5/2 (Item 2 from file: 348)  
DIALOG(R) File 348:EUROPEAN PATENTS  
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01637042

Similarity measure for pattern recognition

Ahnlichkeitsmass fur die Mustererkennung

Mesure de similitude pour la reconnaissance de forme

PATENT ASSIGNEE:

Entropy Software Laboratory, Inc., (3866300), 2217-15, Hayashicho,  
Takamatsu-shi, Kagawa, (JP), (Applicant designated States: all)

INVENTOR:

Jinnai, Michihiro, 2304-17, Yashimanishimachi, Takamatsu-shi, Kagawa,  
(JP)

LEGAL REPRESENTATIVE:

Strehl Schubel-Hopf & Partner (100941), Maximilianstrasse 54, 80538  
Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 1349144 A2 031001 (Basic)

APPLICATION (CC, No, Date): EP 2003005733 030313;

PRIORITY (CC, No, Date): JP 200268231 020313

DESIGNATED STATES: AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES; FI; FR; GB; GR;  
HU; IE; IT; LI; LU; MC; NL; PT; RO; SE; SI; SK; TR

EXTENDED DESIGNATED STATES: AL; LT; LV; MK; RO

INTERNATIONAL PATENT CLASS: G10L-015/10; G06K-009/64

ABSTRACT EP 1349144 A2

Disclosed is a method for obtaining an accurate detected value of a similarity between images or the like. Original standard and input pattern matrices, each having a feature quantity of an image as an element, are created (Sb1 and Sb3). A weighting vector having a value of a change rate of a kurtosis of a reference pattern vector composed of a reference shape as an element is created, and an original and weighted standard pattern matrix is calculated by a product-sum operation of an element value of the weighting vector and an element value of the original standard pattern matrix (Sb2). Then, an original and weighted input pattern matrix is calculated by a product-sum operation of the element value of the same weighting vector and an element value of the original input pattern matrix (Sb4), and a geometric distance value between the original standard pattern matrix and the original input pattern matrix is calculated as a cosine of an angle between the original and weighted standard pattern matrix and the original and weighted input pattern matrix (Sb5).

ABSTRACT WORD COUNT: 178

NOTE:

Figure number on first page: 21

LEGAL STATUS (Type, Pub Date, Kind, Text):

Application: 031001 A2 Published application without search report

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS A                           | (English) | 200340 | 4570       |
| SPEC A                             | (English) | 200340 | 71799      |
| Total word count - document A      |           |        | 76369      |
| Total word count - document B      |           |        | 0          |
| Total word count - documents A + B |           |        | 76369      |

25/5/3 (Item 3 from file: 348)  
DIALOG(R) File 348:EUROPEAN PATENTS  
(c) 2004 European Patent Office. All rts. reserv.

00991498

Method for document rendering and character extraction  
Verfahren zur Dokumentwiedergabe und Zeichenextrahierung  
Methode pour la representation de documents et l'extraction de caracteres  
PATENT ASSIGNEE:

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Applicant designated States: all)

INVENTOR:

Handley, John C., 68 Roselawn Avenue, Fairport, New York 14450, (US)

LEGAL REPRESENTATIVE:

Skone James, Robert Edmund (50281), GILL JENNINGS & EVERY Broadgate House  
7 Eldon Street, London EC2M 7LH, (GB)

PATENT (CC, No, Kind, Date): EP 896294 A2 990210 (Basic)  
EP 896294 A3 991103

APPLICATION (CC, No, Date): EP 98305747 980717;

PRIORITY (CC, No, Date): US 905610 970804

DESIGNATED STATES: DE; FR; GB

EXTENDED DESIGNATED STATES: AL; LT; LV; MK; RO; SI

INTERNATIONAL PATENT CLASS: G06K-009/20

ABSTRACT EP 896294 A2

A method for generating documents such as forms using halftones along with a set of low-complexity image processing steps to extract the characters for recognition. The method exploits texture differences between character strokes and halftoned boxes or text fields. Form frames are rendered as black and white halftones and characters are extracted by exploiting differences in texture between the frames and the character strokes. A sequence of simple image processing operations, easily done in hardware, eliminates the frames while leaving the characters intact. Halftones, giving the appearance of a light color as in the dropout-color method, are easily produced by page description languages; thus, blank and filled-in forms can be scanned, printed, stored and photocopied at low cost.

ABSTRACT WORD COUNT: 119

NOTE:

Figure number on first page: 1

LEGAL STATUS (Type, Pub Date, Kind, Text):

Examination: 000628 A2 Date of request for examination: 20000503

Application: 990210 A2 Published application (Alwith Search Report  
;A2without Search Report)

Examination: 021204 A2 Date of dispatch of the first examination  
report: 20021021

Search Report: 991103 A3 Separate publication of the search report

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS A                           | (English) | 9906   | 308        |
| SPEC A                             | (English) | 9906   | 2317       |
| Total word count - document A      |           |        | 2625       |
| Total word count - document B      |           |        | 0          |
| Total word count - documents A + B |           |        | 2625       |

25/5/4 (Item 4 from file: 348)



DIALOG(R) File 348:EUROPEAN PATENTS  
(c) 2004 European Patent Office. All rts. reserv.

00727670

Searching and matching unrecognized handwriting  
Suche und Vergleich von nicht-erkannter Handschrift  
Recherche et comparaison d'écriture manuscrite non-reconnue

PATENT ASSIGNEE:

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Proprietor designated states: all)

INVENTOR:

Poon, Alex D., 575 South Rengstorff Avenue, Apt. No. 21, Mountain View CA  
94049, (US)

Cass, Todd A., 784 Dolores Street, San Francisco CA 94110, (US)

Weber, Karon Anne, 1330 Union Street, No. 22, San Francisco CA 94109,  
(US)

LEGAL REPRESENTATIVE:

Skone James, Robert Edmund et al (50281), GILL JENNINGS & EVERY Broadgate  
House 7 Eldon Street, London EC2M 7LH, (GB)

PATENT (CC, No, Kind, Date): EP 686931 A2 951213 (Basic)

EP 686931 A3 970108

EP 686931 B1 000308

APPLICATION (CC, No, Date): EP 95303792 950602;

PRIORITY (CC, No, Date): US 254382 940606

DESIGNATED STATES: DE; FR; GB

INTERNATIONAL PATENT CLASS: G06K-009/22 ; G06F-003/033

CITED PATENTS (EP B): EP 464467 A; EP 691623 A; US 5191622 A

CITED REFERENCES (EP B):

NEC RESEARCH AND DEVELOPMENT, vol. 34, no. 2, 1 April 1993, pages  
263-273, XP000322020 KYOJI HIRATA ET AL: "ROUGH SKETCH-BASED IMAGE  
INFORMATION RETRIEVAL";

ABSTRACT EP 686931 A2

A method and system are disclosed for searching and matching gesture-based data such as **handwriting** without performing a **recognition** process on the **handwritten** gesture data to convert it to a standard computer-coded form. **Target** data (16) collected as sample data **points** (20,22) of spatial coordinates over time are concatenated into a single **target** gesture sequence of sample data **points**. The sample data **points** comprising the gesture-based data structure to be searched (the corpus) are grouped into corpus gesture sequences for matching against the **target** gesture sequence. Matching may be done by any suitable method, and a novel signal comparison technique based on dynamic time warping concepts is illustrated. The result of the matching is a list of the locations of the matching corpus gesture sequences in the corpus, which in turn may be used for further processing, such as the display of an image of the matching corpus gestures for a system user. The ability to determine the existence and location of a gesture in the corpus that matches a **target** gesture (10) is the basis for performing a variety of additional functions, such as a "find and replace" function and the ability to use gestures as keywords to index a gesture-based data **structure** without performing **recognition** on either the keyword gestures or the gesture-based data structure. The technique is suitable for inclusion in any system that accepts gesture-based data, such as a personal digital assistant (PDA) or other pen-based computing device.  
(see image in original document)

ABSTRACT WORD COUNT: 249

NOTE:

Figure number on first page: 1

LEGAL STATUS (Type, Pub Date, Kind, Text):

Oppn None: 010221 B1 No opposition filed: 20001209  
Grant: 20000308 B1 Granted patent  
Application: 951213 A2 Published application (A1with Search Report  
;A2without Search Report)  
Search Report: 970108 A3 Separate publication of the European or  
International search report  
Examination: 970910 A2 Date of filing of request for examination:  
970708  
Examination: 971105 A2 Date of despatch of first examination report:  
970923  
Change: 980520 A2 Representative (change)

LANGUAGE (Publication,Procedural,Application): English; English; English  
FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200010 | 1022       |
| CLAIMS B                           | (German)  | 200010 | 953        |
| CLAIMS B                           | (French)  | 200010 | 1323       |
| SPEC B                             | (English) | 200010 | 6495       |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 9793       |
| Total word count - documents A + B |           |        | 9793       |

25/5/5 (Item 5 from file: 348)

DIALOG(R)File 348:EUROPEAN PATENTS

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00603562

Text recognition

Texterkennung

Reconnaissance de texte

PATENT ASSIGNEE:

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Proprietor designated states: all)

INVENTOR:

Chen, Francine R., 975 Sherman Avenue, Menlo Park, California 94025, (US)  
Wilcox, Lynn D., 45 Joaquin Road, Portola Valley, California 94028, (US)

LEGAL REPRESENTATIVE:

Grunecker, Kinkeldey, Stockmair & Schwanhauser Anwaltssozietat (100721)  
, Maximilianstrasse 58, 80538 Munchen, (DE)

PATENT (CC, No, Kind, Date): EP 602956 A2 940622 (Basic)

EP 602956 A3 950118

EP 602956 B1 000830

APPLICATION (CC, No, Date): EP 93310137 931215;

PRIORITY (CC, No, Date): US 991911 921217

DESIGNATED STATES: DE; FR; GB

INTERNATIONAL PATENT CLASS: G06K-009/68

CITED REFERENCES (EP B):

PROC. OF THE 11TH INT. CONF. ON PATTERN RECOGNITION, 30 August 1992, THE  
HAGUE, NL pages 116 - 9 C B BOSE ET S KUO 'Connected and degraded text  
recognition using hidden markov model'

COMPUTER VISION, GRAPHICS AND IMAGE PROCESSING, vol.35, 1986 pages 111 -  
27 T PAVLIDIS 'A vectorizer and feature extractor for document  
recognition'

ICASSP-92 IEEE INT. CONF. ON ACOUSTICS, SPEECH AND SIGNAL PROCESSING,  
vol.2, 23 March 1992, SAN FRANCISCO, CA pages 97 - 100, XP356946 L D  
WILCOX ET M A BUSH 'Training and search algorithms for an interactive  
wordspotting system'

IBM JOURNAL OF RESEARCH AND DEVELOPMENT, vol.26, no.6, November 1982, NEW  
YORK NY pages 681 - 6 N F BRICKMAN 'Word AUTOCorrelation redundancy

match (WARM) technology'  
 U.S. POSTAL SERVICE ADVANCED TECHNOLOGY CONFERENCE, 5 November 1990 page  
 217-231 T K HO, J J HULL ET S N SRIHARI 'A word shape analysis approach  
 to recognition of degraded word images'  
 IEEE TRANS. ON ACOUSTICS, SPEECH AND SIGNAL PROCESSING, vol.38, no.11,  
 November 1990 pages 1870 - 8 J G WILPON ET AL 'Automatic recognition of  
 keywords in unconstrained speech using hidden markov models'  
 SYSTEMS & COMPUTERS IN JAPAN., vol.21, no.4, 1990, NEW YORK NY pages 26 -  
 35, XP159200 T NAKANO ET AL 'A new recognition method for stamped and  
 painted alphanumerals';

ABSTRACT EP 602956 A2

Font-independent spotting of user-defined keywords in a scanned image.  
 Word identification is based on features of the entire word without the  
 need for segmentation or OCR, and without the need to recognize  
 non-keywords. Font-independent character models are created using hidden  
 Markov models (HMMs) and arbitrary keyword models are built from the  
 character HMM components. Word or text line bounding boxes are extracted  
 from the image, a set of features based on the word shape, (and  
 preferably also the word internal structure) within each bounding box is  
 extracted, this set of features is applied to a network that includes one  
 or more keyword HMMs, and a determination is made. The identification of  
 word bounding boxes for potential keywords includes the steps of reducing  
 the image (say by 2x) and subjecting the reduced image to vertical and  
 horizontal morphological closing operations. The bounding boxes of  
 connected components in the resulting image are then used to hypothesize  
 word or text line bounding boxes, and the original bitmaps within the  
 boxes are used to hypothesize words. In a particular embodiment, a range  
 of structuring elements is used for the closing operations to accommodate  
 the variation of inter- and intra-character spacing with font and font  
 size. (see image in original document)

ABSTRACT WORD COUNT: 208

NOTE:

Figure number on first page: 12B

LEGAL STATUS (Type, Pub Date, Kind, Text):

Grant: 000830 B1 Granted patent  
 Application: 940622 A2 Published application (A1with Search Report  
 ;A2without Search Report)  
 Oppn None: 010816 B1 No opposition filed: 20010531  
 Search Report: 950118 A3 Separate publication of the European or  
 International search report  
 Examination: 950913 A2 Date of filing of request for examination:  
 950718  
 Examination: 980708 A2 Date of despatch of first examination report:  
 980526  
 Change: 980826 A2 Representative (change)

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200035 | 959        |
| CLAIMS B                           | (German)  | 200035 | 926        |
| CLAIMS B                           | (French)  | 200035 | 1230       |
| SPEC B                             | (English) | 200035 | 12216      |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 15331      |
| Total word count - documents A + B |           |        | 15331      |

25/5/6 (Item 6 from file: 348)

DIALOG(R) File 348:EUROPEAN PATENTS

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00603559

**Text recognition**

**Texterkennung**

**Reconnaissance de texte**

**PATENT ASSIGNEE:**

XEROX CORPORATION, (219783), Xerox Square, Rochester, New York 14644,  
(US), (Proprietor designated states: all)

**INVENTOR:**

Chen, Francine R., 975 Sherman Avenue, Menlo Park, California 94025, (US)  
Wilcox, Lynn D., 45 Joaquin Road, Portola Valley, California 94028, (US)  
Bloomberg, Dan S., 1013 Paradise Way, Palo Alto, California 94306, (US)

**LEGAL REPRESENTATIVE:**

Grunecker, Kinkeldey, Stockmair & Schwanhauser Anwaltssozietat (100721)  
, Maximilianstrasse 58, 80538 Munchen, (DE)

**PATENT (CC, No, Kind, Date):** EP 602955 A2 940622 (Basic)

EP 602955 A3 950118

EP 602955 B1 001227

**APPLICATION (CC, No, Date):** EP 93310134 931215;

**PRIORITY (CC, No, Date):** US 991913 921217; US 992358 921217

**DESIGNATED STATES:** DE; FR; GB

**INTERNATIONAL PATENT CLASS:** G06K-009/68

**CITED REFERENCES (EP B):**

PROC. OF THE 11TH INT. CONF. ON PATTERN RECOGNITION, 30 August 1992, THE  
HAGUE, NL pages 116 - 9 C B BOSE ET S KUO 'Connected and degraded text  
recognition using hidden markov model'

COMPUTER VISION, GRAPHICS AND IMAGE PROCESSING, vol.35, 1986 pages 111 -  
27 T PAVLIDIS 'A vectorizer and feature extractor for document  
recognition'

ICASSP-92 IEEE INT. CONF. ON ACOUSTICS, SPEECH AND SIGNAL PROCESSING,  
vol.2, 23 March 1992, SAN FRANCISCO, CA pages 97 - 100, XP356946 L D  
WILCOX ET M A BUSH 'Training and search algorithms for an interactive  
wordspotting system'

IBM JOURNAL OF RESEARCH AND DEVELOPMENT, vol.26, no.6, November 1982, NEW  
YORK NY pages 681 - 6 N F BRICKMAN 'Word AUTOCorrelation redundancy  
match (WARM) technology'

U.S. POSTAL SERVICE ADVANCED TECHNOLOGY CONFERENCE, 5 November 1990 page  
217-231 T K HO, J J HULL ET S N SRIHARI 'A word shape analysis approach  
to recognition of degraded word images';

**ABSTRACT EP 602955 A2**

Font-independent spotting of user-defined keywords in a scanned image.  
Word identification is based on features of the entire word without the  
need for segmentation or OCR, and without the need to recognize  
non-keywords. Font-independent character models are created using hidden  
Markov models (HMMs) and arbitrary keyword models are built from the  
character HMM components. Word or text line bounding boxes are extracted  
from the image, a set of features based on the word shape, (and  
preferably also the word internal structure) within each bounding box is  
extracted, this set of features is applied to a network that includes one  
or more keyword HMMs, and a determination is made. The identification of  
word bounding boxes for potential keywords includes the steps of reducing  
the image (say by 2x) and subjecting the reduced image to vertical and  
horizontal morphological closing operations. The bounding boxes of  
connected components in the resulting image are then used to hypothesize  
word or text line bounding boxes, and the original bitmaps within the  
boxes are used to hypothesize words. In a particular embodiment, a range  
of structuring elements is used for the closing operations to accommodate  
the variation of inter- and intra-character spacing with font and font  
size. (see image in original document)

ABSTRACT WORD COUNT: 208

NOTE:

Figure number on first page: 2

LEGAL STATUS (Type, Pub Date, Kind, Text):

Grant: 001227 B1 Granted patent  
Application: 940622 A2 Published application (A1with Search Report  
;A2without Search Report)  
Oppn None: 011219 B1 No opposition filed: 20010928  
Search Report: 950118 A3 Separate publication of the European or  
International search report  
Change: 950118 A2 International patent classification (change)  
Change: 950118 A2 Obligatory supplementary classification  
(change)  
Examination: 950913 A2 Date of filing of request for examination:  
950718  
Examination: 980708 A2 Date of despatch of first examination report:  
980526  
Change: 980805 A2 Representative (change)

LANGUAGE (Publication,Procedural,Application): English; English; English

FULLTEXT AVAILABILITY:

| Available Text                     | Language  | Update | Word Count |
|------------------------------------|-----------|--------|------------|
| CLAIMS B                           | (English) | 200052 | 727        |
| CLAIMS B                           | (German)  | 200052 | 695        |
| CLAIMS B                           | (French)  | 200052 | 856        |
| SPEC B                             | (English) | 200052 | 12095      |
| Total word count - document A      |           |        | 0          |
| Total word count - document B      |           |        | 14373      |
| Total word count - documents A + B |           |        | 14373      |

25/5/7 (Item 7 from file: 348)

DIALOG(R)File 348:EUROPEAN PATENTS

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00578720

Method for deriving character features in a character recognition system  
Verfahren zum Ableiten der Merkmale von Zeichen in einem  
Zeichenerkennungssystem  
Methode pour derivier des caracteristiques de caracteres dans un systeme de  
reconnaissance de caracteres

PATENT ASSIGNEE:

Koninklijke KPN N.V., (1066890), Stationsplein 7, 9726 AE Groningen,  
(NL), (Proprietor designated states: all)

INVENTOR:

Wilcke, Robert, Spinozaweg 9, NL-2202 AV Noordwijk, (NL)

PATENT (CC, No, Kind, Date): EP 604687 A1 940706 (Basic)  
EP 604687 B1 000419

APPLICATION (CC, No, Date): EP 92204106 921230;

PRIORITY (CC, No, Date): EP 92204106 921230

DESIGNATED STATES: AT; BE; CH; DE; DK; ES; FR; GB; GR; IE; IT; LI; LU; NL;  
PT; SE

INTERNATIONAL PATENT CLASS: G06K-009/48

CITED PATENTS (EP B): US 4566124 A

CITED REFERENCES (EP B):

PROCEEDINGS OF THE 6TH INTERNATIONAL CONFERENCE ON PATTERN RECOGNITION,  
MUNICH October 19-22, 1982, IBEE, NEW YORK, US pages 783 - 785 RYU-ICHI  
OKA 'Handwritten Chinese-Japanese characters recognition by using  
cellular feature'

PROCEEDINGS IEEE COMPUTER SOC. CONF. ON COMPUTER VISION AND PATTERN  
RECOGNITION, CVPR'86, MIAMI BEACH, FL June 22-26, 1986, IEEE COMP.SOC.

PRESS, WASHINGTON, US pages 162 - 167 JUN TSUKUMO & KO ASAI 'MACHINE  
PRINTED CHINESE AND JAPANESE CHARACTER RECOGNITION METHOD AND  
EXPERIMENTS FOR READING JAPANESE POCKET BOOKS' Chapter 3: 'Feature  
extraction process'  
SYSTEMS & COMPUTERS IN JAPAN vol. 22, no. 5, June 1991, NEW YORK US pages  
81 - 93 , XP240757 MUTSUO SANO ET AL. 'Gray-Level Image Recognition  
Based on Multiple Cell-Features';

ABSTRACT EP 604687 A1

A method for deriving character features in a character recognition system for recognising characters, such as letters and digits, and a character recognition system in which the method is applied. After deriving a character description from a recorded image pattern of a character to be recognised, a unique point  $P(\text{sub}(i))$  of said character description is appended, by means of a distance transform, to each point  $R(\text{sub}(i))$  of a subset  $R = (R(\text{sub}(i))/i=1, \dots, N)$  of preselected reference points in the plane of said image pattern. Feature values of one or more features possessed by the character description in each appended unique point are then determined.

If the character description is a contour description, the unique point  $P(\text{sub}(i))$  appended to each reference point  $R(\text{sub}(i))$  is that point where the reference point  $R(\text{sub}(i))$  has the shortest distance  $D(R(\text{sub}(i)))$  to the contour of the character, and the character features selected are the shortest distance  $D(R(\text{sub}(i)))$  and the direction  $H(R(\text{sub}(i)))$  of the contour in the appended point  $P(\text{sub}(i))$ . (see image in original document)

ABSTRACT WORD COUNT: 179

NOTE:

Figure number on first page: 4

LEGAL STATUS (Type, Pub Date, Kind, Text):

Oppn None: 010404 B1 No opposition filed: 20010120

Grant: 20000419 B1 Granted patent

Application: 940706 A1 Published application (A1with Search Report  
;A2without Search Report)

Examination: 950201 A1 Date of filing of request for examination:  
941209

\*Assignee: 981202 A1 Applicant (name, address) (change)

Examination: 990303 A1 Date of despatch of first examination report:  
990119

LANGUAGE (Publication,Procedural,Application): English; English; Dutch

FULLTEXT AVAILABILITY:

| Available Text | Language | Update | Word Count |
|----------------|----------|--------|------------|
|----------------|----------|--------|------------|

|          |           |        |     |
|----------|-----------|--------|-----|
| CLAIMS B | (English) | 200016 | 504 |
|----------|-----------|--------|-----|

|          |          |        |     |
|----------|----------|--------|-----|
| CLAIMS B | (German) | 200016 | 478 |
|----------|----------|--------|-----|

|          |          |        |     |
|----------|----------|--------|-----|
| CLAIMS B | (French) | 200016 | 597 |
|----------|----------|--------|-----|

|        |           |        |      |
|--------|-----------|--------|------|
| SPEC B | (English) | 200016 | 5576 |
|--------|-----------|--------|------|

|                               |   |
|-------------------------------|---|
| Total word count - document A | 0 |
|-------------------------------|---|

|                               |      |
|-------------------------------|------|
| Total word count - document B | 7155 |
|-------------------------------|------|

|                                    |      |
|------------------------------------|------|
| Total word count - documents A + B | 7155 |
|------------------------------------|------|

25/5/8 (Item 8 from file: 349)

DIALOG(R) File 349:PCT FULLTEXT

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01004332 \*\*Image available\*\*

CHARACTER STRING IDENTIFICATION

IDENTIFICATION DE CHAINE DE CARACTERES

Patent Applicant/Assignee:

SILVERBROOK RESEARCH PTY LTD, 393 Darling Street, Balmain, New South

Wales 2041, AU, AU (Residence), AU (Nationality), (For all designated states except: US)  
Patent Applicant/Inventor:  
NAPPER Jonathon Leigh, Silverbrook Research Pty Ltd, 393 Darling Street, Balmain, New South Wales 2041, AU, AU (Residence), AU (Nationality), (Designated only for: US)  
Legal Representative:  
SILVERBROOK Kia (agent), Silverbrook Research Pty Ltd, 393 Darling Street, Balmain, New South Wales 2041, AU,  
Patent and Priority Information (Country, Number, Date):  
Patent: WO 200334326 A1 20030424 (WO 0334326)  
Application: WO 2002AU1392 20021015 (PCT/WO AU0201392)  
Priority Application: AU 20018246 20011015  
Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
(EP) AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LU MC NL PT SE SK TR  
(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG  
(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW  
(EA) AM AZ BY KG KZ MD RU TJ TM  
Main International Patent Class: G06K-009/62  
International Patent Class: G06K-009/72  
Publication Language: English  
Filing Language: English  
Fulltext Availability:  
Detailed Description  
Claims  
Fulltext Word Count: 7422

#### English Abstract

The present invention provides a method of identifying a string formed from a number of hand-written characters, such as hand-written words. In order to achieve this, the method operates to determine character probabilities for each character in the string, as well as to determine the probability of the string corresponding to a predetermined form of template. In this regard, each template represents a respective combination of character types. The template and character probabilities are then combined to determine string probabilities, with the character string being identified in accordance with the determined string probabilities.

#### French Abstract

L'invention concerne un procede permettant d'identifier une chaine formee d'un certain nombre de caracteres manuscrits, tels que des mots manuscrits. A cet effet, le procede permet de determiner des probabilites de caracteres, pour chaque caractere de la chaine, ainsi que de determiner la probabilite d'une chaine correspondant a une forme predeterminee d'un modele. Chaque modele represente une combinaison propre de types de caracteres. Le modele et les probabilites de caracteres sont ensuite combines pour determiner des probabilites de chaine, la chaine de caracteres etant identifiee en fonction des probabilites de chaine determinees.

Legal Status (Type, Date, Text)

Publication 20030424 A1 With international search report.

Examination 20030619 Request for preliminary examination prior to end of 19th month from priority date

DIALOG(R) File 349:PCT FULLTEXT  
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01004323 \*\*Image available\*\*

**CHARACTER IDENTIFICATION**

**IDENTIFICATION DE CARACTERES**

Patent Applicant/Assignee:

SILVERBROOK RESEARCH PTY LTD, 393 Darling Street, Balmain, New South  
Wales 2041, AU, AU (Residence), AU (Nationality), (For all designated  
states except: US)

Patent Applicant/Inventor:

NAPPER Jonathon Leigh, Silverbrook Research Pty Ltd, 393 Darling Street,  
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(Designated only for: US)

Legal Representative:

SILVERBROOK Kia (agent), Silverbrook Research Pty Ltd, 393 Darling  
Street, Balmain, New South Wales 2041, AU,

Patent and Priority Information (Country, Number, Date):

Patent: WO 200334317 A1 20030424 (WO 0334317)

Application: WO 2002AU1394 20021015 (PCT/WO AU0201394)

Priority Application: AU 20018244 20011015

Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU  
CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP  
KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO  
RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
(EP) AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LU MC NL PT SE SK TR  
(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG  
(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW  
(EA) AM AZ BY KG KZ MD RU TJ TM

Main International Patent Class: G06K-009/00

International Patent Class: G06K-009/66

Publication Language: English

Filing Language: English

Fulltext Availability:

Detailed Description

Claims

Fulltext Word Count: 8548

**English Abstract**

The present invention provides a method of modifying a classification scheme for classifying hand-written characters to thereby make the classification scheme user dependent. The classification scheme includes a number of allographs, each allograph representing a respective style of a respective letter. The method includes obtaining at least one hand-written character, and then selecting an allograph representing the character. One or more of the allographs are then modified in accordance with the selection, to thereby reflect the fact that the allograph corresponds to a style of letter used by the user.

**French Abstract**

La presente invention porte sur un procede de modification d'un systeme de classification destine a classifier des caracteres manuscrits, ce procede visant a rendre ce systeme dependant de l'utilisateur. Le systeme de classification comprend un nombre d'allographes, chaque allographe representant le style d'une lettre. Le procede consiste a obtenir au moins un caractere manuscrit, puis a selectionner un allographe representant ce caractere ; et modifier au moins un des allographes en fonction de la selection de sorte que l'allographe corresponde au style de la lettre employe par l'utilisateur.

Legal Status (Type, Date, Text)



Publication 20030424 A1 With international search report.

25/5/10 (Item 10 from file: 349)  
DIALOG(R) File 349:PCT FULLTEXT  
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00905659

SYSTEM, PROCESS AND SOFTWARE ARRANGEMENT FOR RECOGNIZING HANDWRITTEN  
CHARACTERS

SYSTEME, PROCEDE ET CONFIGURATION D'UN LOGICIEL PERMETTANT DE RECONNAITRE  
DES CARACTERES MANUSCRITS

Patent Applicant/Assignee:

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US, US (Residence), US (Nationality), (For all designated states  
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(Residence), KR (Nationality), (Designated only for: US)

PIPES Mark, 475 Memorial Drive, Room 312, Cambridge, MA 02139, US, US  
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Legal Representative:

ABELEV Gary (agent), Baker Botts LLP, 30 Rockefeller Plaza, New York, NY  
10112-0228, US,

Patent and Priority Information (Country, Number, Date):

Patent: WO 200237933 A2-A3 20020516 (WO 0237933)

Application: WO 2001US47925 20011108 (PCT/WO US2001047925)

Priority Application: US 2000246844 20001108; US 2001288556 20010503

Designated States: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU

CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP

KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO

RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

(EP) AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE TR

(OA) BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG

(AP) GH GM KE LS MW MZ SD SL SZ TZ UG ZW

(EA) AM AZ BY KG KZ MD RU TJ TM

Main International Patent Class: G06K-009/18

Publication Language: English

Filing Language: English

Fulltext Availability:

Detailed Description

Claims

Fulltext Word Count: 19192

English Abstract

A process and system (50) are provided for determining a most likely combination of characters. In particular, character data which includes information (120) indicative of at least one handwritten character is obtained. The character data includes at least one set of segmentation (140) points for the handwritten character. It is possible to compare visual aspects of the handwritten character to visual aspects of each of the previously stored characters for determining likely characters. Also, a Fisher Matching (245) procedure can be used on the character data to ascertain the likely characters.

French Abstract

L'invention porte sur un procede et un systeme permettant de determiner une des combinaisons les plus probables de caracteres, et, plus precisement, de recueillir des donnees de caractere qui comprennent des

informations indiquant au moins un caractere manuscrit. Lesdites donnees de caractere comprennent egalement au moins un ensemble de points de segmentation pour le caractere manuscrit. Il est ensuite possible de fournir un indice a chaque caractere particulier d'un ensemble de caracteres prealablement stockes, au moyen d'une comparaison entre les donnees de caractere et le caractere particulier prealablement stocke. En outre, il est possible de comparer les aspects visuels du caractere manuscrit avec les aspects visuels de chacun des caracteres prealablement stockes afin de determiner les caracteres probables. Il est egalement possible d'utiliser un procede Fisher Matching sur les donnees de caractere afin d'etablir les caracteres probables. Plusieurs caracteres manuscrits peuvent comprendre un premier caractere relie a un deuxieme caractere des caracteres manuscrits par une ligature. Il est aussi possible de determiner un autre indice de la ligature en fonction du point de depart de la ligature et du point d'arrivee de ladite ligature. Par ailleurs, le premier caractere peut etre relie au deuxieme caractere par une transition. Il est egalement possible d'etablir un indice particulier de la transition selon une difference de longueur entre le premier et le deuxieme caractere. Cet indice particulier peut etre combine avec un indice correspondant aux caracteres manuscrits particuliers.

Legal Status (Type, Date, Text)

Publication 20020516 A2 Without international search report and to be republished upon receipt of that report.  
Examination 20021010 Request for preliminary examination prior to end of 19th month from priority date  
Search Rpt 20040108 Late publication of international search report  
Republication 20040108 A3 With international search report.

25/5/11 (Item 11 from file: 349)

DIALOG(R) File 349:PCT FULLTEXT

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00317917 \*\*Image available\*\*

**A HANDWRITING RECOGNITION SYSTEM**

**SYSTEME DE RECONNAISSANCE DE CARACTERES MANUSCRITS**

Patent Applicant/Assignee:

ADVANCED RECOGNITION TECHNOLOGIES INC,

Inventor(s):

AHARONSON Eran,

DAVIDOR Yuval,

DAVIDOV Doron,

ILAN Gabriel,

Patent and Priority Information (Country, Number, Date):

Patent: WO 9600424 A1 19960104

Application: WO 95US7597 19950627 (PCT/WO US9507597)

Priority Application: IL 110137 19940627

Designated States: AU CA JP KR AT BE CH DE DK ES FR GB GR IE IT LU MC NL PT SE

Main International Patent Class: G06K-009/00

International Patent Class: G06K-09:46

Publication Language: English

Fulltext Availability:

Detailed Description

Claims

Fulltext Word Count: 9892

English Abstract

A handwritten pattern recognition system which compares input strokes to

reference strokes includes a tangent and stable point extractor (24), a reference database (28) and a stable-point-based classifier (26). The extractor determines tangents to at least some of the sample points of the input stroke and stable points of the input stroke. The reference database stores tangents and stable points of the reference strokes. The classifier divides each input and reference stroke into at least two substrokes wherein each substroke has at least one of the stable points at an end thereof. The classifier also generates stroke match values indicating the quality of the match between the input stroke and the reference strokes. The classifier selects the reference stroke providing the best match to the input stroke according to a matching criterion. Finally, the classifier selects the best matching reference pattern.

#### French Abstract

Un systeme de reconnaissance de formes manuscrites comparant des batonnets d'entree a des batonnets de reference comporte un extracteur de tangentes et de points stables (24), une base de donnees de reference (28) et un classifieur (26) sur la base de points stables. L'extracteur determine les tangentes a au moins certains des points echantillons du batonnet d'entree et des points stables de ce dernier. La base de donnees de reference memorise les tangentes et les points stables des batonnets de reference. Le classifieur divise chaque batonnet d'entree et de reference en au moins deux sous-batonnets, chaque sous-batonnet presentant au moins un des points stables a l'une de ses extremités. Le classifieur genere egalement des valeurs de correspondance de batonnets indiquant la qualite de la correspondance entre le batonnet d'entree et les batonnets de reference. Le classifieur selectionne, selon un critere de correspondance, le batonnet de reference assurant la meilleure correspondance avec le batonnet d'entree. Enfin, le classifieur selectionne la forme de reference dont les batonnets correspondent le mieux aux batonnets de la forme d'entree.

?

? show files;ds;save temp;log hold  
 File 344:Chinese Patents Abs Aug 1985-2004/Mar  
 (c) 2004 European Patent Office  
 File 347:JAPIO Nov 1976-2003/Nov(Updated 040308)  
 (c) 2004 JPO & JAPIO  
 File 350:Derwent WPIX 1963-2004/UD,UM &UP=200417  
 (c) 2004 Thomson Derwent

| Set | Items   | Description  |
|-----|---------|--|
| S1  | 6596743 | SHAPE? ? OR FORM? ? OR FIGURE? ? OR POSTURE?? OR STRUCTUR?   |
| S2  | 12857   | SCRIBBL? OR SCRAWL??? OR CACOGRAPH? OR HANDDRAW? OR GRAFFI-<br>TI OR HANDWRIT? OR (HAND OR SCRATCH?) (3N) (DRAW? OR WRIT?) |
| S3  | 2843    | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N)S2                                      |
| S4  | 35454   | (RECOGNI? OR IDENTIF? OR DETERMIN? OR ANALY? OR FIND OR FI-<br>NDING OR FINDS) (3N)S1                                      |
| S5  | 1334246 | (POINT? ? OR TARGET? ? OR DOT OR DOTS OR SPOT OR SPOTS)  |
| S6  | 1361182 | DISTANC? OR LENGTH? OR CLOSENESS OR PROXIMIT? OR (LOCATION?<br>? OR PLACEMENT?) (3N)S5                                     |
| S7  | 207999  | THRESHOLD? ? OR (PREDETERMIN? OR PRE()DETERMIN?) (3N)S6  |
| S8  | 592518  | CURVE? ? OR ARC OR ARCH? ? OR BEND OR BENDS OR CURL OR CUR-<br>LS OR TRAJECTOR? OR SPLINE                                  |
| S9  | 1860163 | STRAIGHT? OR LINE? ? OR ALIGN? OR UNBENT OR UNCURLLED OR UN-<br>( )S8  |
| S10 | 141     | S3 AND S4  |
| S11 | 8       | S10 AND S7   |
| S12 | 4       | S11 AND (S8 OR S9)   |
| S13 | 4       | IDPAT (sorted in duplicate/non-duplicate order)  |
| S14 | 4       | IDPAT (primary/non-duplicate records only)   |
| S15 | 4       | S11 NOT S14  |
| S16 | 4       | IDPAT (sorted in duplicate/non-duplicate order)  |
| S17 | 4       | IDPAT (primary/non-duplicate records only)   |
| S18 | 19      | S10 AND S6   |
| S19 | 10      | S18 AND (S8 OR S9)   |
| S20 | 6       | S19 NOT S11  |
| S21 | 8       | S10 AND S8 AND S9  |
| S22 | 4       | S21 NOT (S11 OR S20)   |
| S23 | 7       | S18 NOT (S11 OR S19 OR S22)  |
| S24 | 33      | S10 AND IC=(G06K-009/00 OR G06K-009/46) NOT (S11 OR S19 OR<br>S22 OR S23)  |
| S25 | 5       | S24 AND S5   |
| S26 | 5       | IDPAT (sorted in duplicate/non-duplicate order)  |
| S27 | 5       | IDPAT (primary/non-duplicate records only)   |

14/3,K/1 (Item 1 from file: 350)  
DIALOG(R) File 350:Derwent WPIX  
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011257580 \*\*Image available\*\*

WPI Acc No: 1997-235483/199721

Related WPI Acc No: 1993-379555; 1995-336633; 1995-382677; 1996-370973;  
1996-370974; 1997-086939; 1997-201779; 1997-271615; 1997-297621

XRPX Acc No: N97-194772

**Pointer-based computer apparatus capable of aligning geometric figures**  
- includes shape recognition engine which is receptive to stroke  
group to recognise it as geometric figure which is provided to  
display in accordance with determined alignment parameters

Patent Assignee: APPLE COMPUTER INC (APPY )

Inventor: BOZINOVIC R; PAGALLO G

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 5621817 | A    | 19970415 | US 92889216 | A    | 19920527 | 199721 B |
|            |      |          | US 931122   | A    | 19930105 |          |
|            |      |          | US 931123   | A    | 19930105 |          |
|            |      |          | US 94180559 | A    | 19940112 |          |
|            |      |          | US 95422130 | A    | 19950413 |          |

Priority Applications (No Type Date): US 94180559 A 19940112; US 92889216 A  
19920527; US 931122 A 19930105; US 931123 A 19930105; US 95422130 A  
19950413

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC    | Filing Notes   |
|------------|------|-----|----|-------------|--|
| US 5621817 | A    |     | 44 | G06K-009/00 | CIP of application US 92889216<br>CIP of application US 931122<br>CIP of application US 931123<br>Cont of application US 94180559<br>Cont of patent US 5452371 |

**Pointer-based computer apparatus capable of aligning geometric figures**  
...

...includes shape recognition engine which is receptive to stroke group  
to recognise it as geometric figure which is provided to display in  
accordance with determined alignment parameters

...Abstract (Basic): screen which is sensitive to the location of a  
pointer. A stroke grouper is receptive to a series of strokes formed on  
the display. A **shape recognition** engine is receptive to the stroke  
group and recognises it as a geometric figure. The value of an  
**alignment** parameter is determined for a new geometric figure which is  
provided to the display screen...

...A fixed value, and a mean value of the **alignment** parameter, and a  
variance from the mean value for the geometric figures making up the  
cluster, are determined for a cluster of geometric figures on the  
screen. It is determined whether the **alignment** parameter of the new  
geometric figure added to the display screen is within a defined  
**threshold** distance of the cluster's mean value. The new geometric  
figure is **aligned** with the cluster on the display. The cluster's mean  
value and variance from the mean is redefined for new geometric figures  
making up the...

...USE/ADVANTAGE - Capable of real-time recognition of hand - drawn shapes on screen...  
...Title Terms: ALIGN ;

14/3,K/2 (Item 2 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

010435313 \*\*Image available\*\*  
WPI Acc No: 1995-336633/199543  
Related WPI Acc No: 1993-379555; 1995-382677; 1996-370973; 1996-370974;  
1997-086939; 1997-201779; 1997-235483; 1997-271615; 1997-297621  
XRPX Acc No: N95-252446  
Computer system display screen shapes arranging using dual function display assembly - receiving at least one user initiated stroke, followed by grouping with related strokes to form stroke gp  
Patent Assignee: APPLE COMPUTER INC (APPY )  
Inventor: BOZINOVIC R; PAGALLO G  
Number of Countries: 001 Number of Patents: 001  
Patent Family:  

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 5452371 | A    | 19950919 | US 92889216 | A    | 19920527 | 199543 B |
|            |      |          | US 931122   | A    | 19930105 |          |
|            |      |          | US 94180559 | A    | 19940112 |          |

Priority Applications (No Type Date): US 94180559 A 19940112; US 92889216 A 19920527; US 931122 A 19930105  
Patent Details:  

| Patent No  | Kind | Lan Pg | Main IPC    | Filing Notes                   |
|------------|------|--------|-------------|--------------------------------|
| US 5452371 | A    | 46     | G06K-009/00 | CIP of application US 92889216 |
|            |      |        |             | CIP of application US 931122   |

...Abstract (Basic): The method involves determining a value of alignment parameter for each shape added to a display screen, followed by defining for each cluster a fixed value for the alignment parameter, a mean value of the alignment parameter, and a variance from the mean value for the shapes making up the cluster...

...The method also entails determining whether the value of a new shape's alignment parameter is within a defined threshold distance of any cluster's mean value, if the new shape's alignment parameter is within the defined threshold distance of a close cluster's mean value. The new shape is then add to that cluster such that the new shape is aligned with the fixed value of the close cluster...

...USE/ADVANTAGE - In graphical user interface of pen-based computer system. Capable of real-time recognition of hand drawn shapes on screen, while recognising simple shapes such as triangles, squares, circles, complex opened and closed polygons, ellipses, composite curves etc...

14/3,K/3 (Item 3 from file: 347)  
DIALOG(R)File 347:JAPIO  
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01658392 \*\*Image available\*\*  
ON- LINE RECOGNITION DEVICE OF HAND WRITTEN GRAPHIC

PUB. NO.: 60-136892 [JP 60136892 A]  
PUBLISHED: July 20, 1985 (19850720)  
INVENTOR(s): SHIYOUJIMA HIROSHI  
KUZUNUKI SOSHIRO  
HIRASAWA KOTARO  
APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 58-249704 [JP 83249704]  
FILED: December 26, 1983 (19831226)  
JOURNAL: Section: P, Section No. 409, Vol. 09, No. 304, Pg. 99,  
November 30, 1985 (19851130)

ON- LINE RECOGNITION DEVICE OF HAND WRITTEN GRAPHIC

ABSTRACT

PURPOSE: To allow on- line recognition independent of inclination of a graphic a stroke order and the number of strokes and to enhance operability of a machine by dividing graphic...

...CONSTITUTION: A distance between coordinate points is set to a threshold value, and a coordinate point string D1 from a tablet 100 is stored in a memory 300 as coordinate point data D2 by sampling. A range of coordinate point data D2' from pendown to penup stored in the memory 300 are converted into line segment data D3 which are converted into straight line or curve data D4 according to an angle change in ranging two line segments. Angles at starting and end points of each line segment of the data D4 are quantized by 32 direction code CD, thereby obtaining data D5. Then connecting relation between respective line segments in said converted data D4 is investigated. A direction code string D6 is made which is arranged in the one direction from the line segment quantized data D5 and a list 1. By comparing the direction code string D6 with a reference figure GST, similarity degree F is calculated. The similarity degree obtained in such a way is compared with a threshold  $F_0 (=10)$  set beforehand. When  $F < F_0$ , a candidate figure obtaining the similarity degree F is outputted as a recognition figure G(sub r).

14/3,K/4 (Item 4 from file: 347)  
DIALOG(R)File 347:JAPIO  
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01658390 \*\*Image available\*\*  
REAL-TIME RECOGNITION DEVICE OF HAND - WRITTEN LOCUS

PUB. NO.: 60-136890 [JP 60136890 A]  
PUBLISHED: July 20, 1985 (19850720)  
INVENTOR(s): KUZUNUKI SOSHIRO  
SHIYOUJIMA HIROSHI  
YOKOYAMA TAKANORI  
APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 58-244009 [JP 83244009]  
FILED: December 26, 1983 (19831226)  
JOURNAL: Section: P, Section No. 409, Vol. 09, No. 304, Pg. 98,  
November 30, 1985 (19851130)

REAL-TIME RECOGNITION DEVICE OF HAND - WRITTEN LOCUS

ABSTRACT

...CONSTITUTION: If stroke length, which is a line segment from pendown to penup is over the prescribed length ( threshold ), it is recognized to be

a stroke to compose of a figure, and if it is below the prescribed length, it is recognized to be...

... character. A coordinate input string (stroke information) detected by a coordinate input device (tablet) 1 and a stylus pen 2 is first inputted to a hand - written paper recognition device 9. Then a character recognition means 5 to recognize hand - written characters and a figure recognition means 6 to recognize hand - written figures are separated from the stroke information, by a threshold learning means to learn an input and calculate a threshold and a stroke separation means to separate a character stroke and a figure stroke, and transmitted. Signals from the recognition means 5 and 6 are transmitted to a CRT display 8 through a character/figure display means 7, and recognized characters and figures are displayed.

?



17/3,K/1 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

013465350 \*\*Image available\*\*  
WPI Acc No: 2000-637293/200061  
XRPX Acc No: N00-472591

Shape generating method for recognizing handwritten characters in  
computer systems using pattern prototypes and position probability table

Patent Assignee: MICROSOFT CORP (MICR-N)

Inventor: HULLENDER G N

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 6094506 | A    | 20000725 | US 95548261 | A    | 19951025 | 200061 B |

Priority Applications (No Type Date): US 95548261 A 19951025

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC    | Filing Notes |
|------------|------|-----|----|-------------|--------------|
| US 6094506 | A    |     | 44 | G06K-009/18 |              |

Shape generating method for recognizing handwritten characters in  
computer systems using pattern prototypes and position probability table

Abstract (Basic):

... For recognizing handwritten characters...

...a fortuitous choice of a set of shape features, tedious trials and error  
refinements of the estimates in the shape feature matrix and the  
distance threshold, or an arbitrary choice of how to weigh the  
results of the shape feature comparison with the distance threshold.

17/3,K/2 (Item 2 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

012078269 \*\*Image available\*\*  
WPI Acc No: 1998-495180/199842  
XRPX Acc No: N98-386799

Handwritten symbol recognising method using personal digital  
assistant device, hand-held device - involves comparing normalized symbol  
error signal with stored sequence of feature mask to determine minimum  
normalized symbol error signal corresponding to predetermined symbol

Patent Assignee: MICROCHIP TECHNOLOGY INC (MICR-N)

Inventor: BASEHORE P M

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 5802204 | A    | 19980901 | US 95481168 | A    | 19950607 | 199842 B |

Priority Applications (No Type Date): US 95481168 A 19950607

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC    | Filing Notes |
|------------|------|-----|----|-------------|--------------|
| US 5802204 | A    |     | 32 | G06K-009/00 |              |

Handwritten symbol recognising method using personal digital  
assistant device, hand-held device...

...Abstract (Basic): normalized symbol error signal is compared with the stored sequence of feature mask to determine minimum normalized symbol error signal corresponding to predetermined symbol. Thus, **handwritten symbol is recognised** corresponding to predetermined symbol...

...USE - For image, pattern recognition and biological or chemical **structure identification** .

...ADVANTAGE - Provides handwritten character translator for adjusting error lthreshold to compensate for variation in user's handwriting. Updates new characters or symbols without extensive reprogramming

17/3,K/3 (Item 3 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

008351803 \*\*Image available\*\*  
WPI Acc No: 1990-238804/199031  
XRPX Acc No: N90-185209

**Handwritten connected figure identifying method - interpolating selected branches within recognition block to establish portions of branches which are missing**

Patent Assignee: GLORY KOGYO KK (GLOR )  
Inventor: FUJITA Y; KAMEYAMA H; MIKI S; OHNISHI K; UOSAKI K  
Number of Countries: 001 Number of Patents: 001  
Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 4933977 | A    | 19900612 | US 88247663 | A    | 19880922 | 199031 B |

Priority Applications (No Type Date): JP 87280087 A 19871105

**Handwritten connected figure identifying method...**

...Abstract (Basic): The connected **figure identifying** method comprises the steps of identifying and prioritising branches of the connected figures, where branches closest to the first end of the candidate block are...

...relatively higher priority than branches closest to the second end of the candidate block. The candidate block is divided into a recognition block extending a **predetermined distance** from the first end of the candidate block. A determination is then made as to whether a **recognisable figure** exists in the **recognition** block. In the absence of a **recognisable figure** in the **recognition** block, a branch having a lowest priority within the recognition block is erased

17/3,K/4 (Item 4 from file: 347)  
DIALOG(R)File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

04724520 \*\*Image available\*\*  
METHOD FOR GENERATING DICTIONARY FOR DISCRIMINATION

PUB. NO.: 06-195520 [JP 6195520 A]  
PUBLISHED: July 15, 1994 (19940715)

INVENTOR(s): SUWA MISAKO  
HAI TOUZEN  
YOSHITAKE TOSHIYUKI  
AKIMOTO HARUO  
APPLICANT(s): FUJITSU LTD [000522] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 04-344960 [JP 92344960]  
FILED: December 25, 1992 (19921225)

ABSTRACT

PURPOSE: To generate a dictionary with a high recognition rate for the dictionary generating method for **shape recognition** such as **handwritten character recognition**.

...  
...grid shape and the number of shape patterns for learning which belong to each divided area is counted; when the number is larger than a **threshold** value, a dictionary is generated from the shape pattern for learning in the area.  
?

20/3,K/1 (Item 1 from file: 347)  
DIALOG(R)File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

04408463 \*\*Image available\*\*  
ON- LINE HANDWRITTEN CHARACTER RECOGNIZING METHOD

PUB. NO.: 06-052363 [JP 6052363 A]  
PUBLISHED: February 25, 1994 (19940225)  
INVENTOR(s): RIYUU GAKUHEI  
APPLICANT(s): RICOH CO LTD [000674] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 04-201195 [JP 92201195]  
FILED: July 28, 1992 (19920728)  
JOURNAL: Section: P, Section No. 1747, Vol. 18, No. 293, Pg. 23, June  
03, 1994 (19940603)

ON- LINE HANDWRITTEN CHARACTER RECOGNIZING METHOD

#### ABSTRACT

PURPOSE: To improve a recognition rate by analyzing the refusal cause of a recognition refusal character, and performing reprocessing considering character size, stroke size, and distance between strokes...

...CONSTITUTION: A character is inputted by moving an electronic pen 2 on a tablet 1. An on- line character data input part 3 converts and accepts an input character as a time series data. Character structure pre-processed by a pre- processing part 4, after being analyzed by a structure analysis part 5, is matched with the model of a dictionary 7, and recognition processing is applied to it. A reprocessing part 8 performs the reprocessing...

... recognition part 6 by using two kinds of noise eliminating methods and three kinds of stroke connecting methods, and the data is delivered to the structure analysis part 5.

20/3,K/2 (Item 2 from file: 347)  
DIALOG(R)File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

03081189 \*\*Image available\*\*  
ON- LINE HANDWRITTEN CHARACTER RECOGNIZING DEVICE

PUB. NO.: 02-056689 [JP 2056689 A]  
PUBLISHED: February 26, 1990 (19900226)  
INVENTOR(s): CHATANI KIMIYUKI  
YOSHIDA KIMIYOSHI  
SAKANO AKIO  
TAMORI HIROBUMI  
APPLICANT(s): SONY CORP [000218] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 63-209094 [JP 88209094]  
FILED: August 23, 1988 (19880823)  
JOURNAL: Section: P, Section No. 1049, Vol. 14, No. 233, Pg. 26, May  
17, 1990 (19900517)

ON- LINE HANDWRITTEN CHARACTER RECOGNIZING DEVICE

ABSTRACT

... satisfy a pursuit condition, which is described by a pursuit condition symbol in the character dictionary, in the holograph with utilizing information such as the length of the element, which is obtained in linear element data, and the coordinates of a starting point, etc. Then, sub stroke data, which are composed...

... sends a decided result to a character recognizing and deciding circuit 9. Thus, the character of the running-hand or the character in the simplified form can be easily recognized.

20/3,K/3 (Item 3 from file: 347)

DIALOG(R)File 347:JAPIO

(c) 2004 JPO & JAPIO. All rts. reserv.

01856575 \*\*Image available\*\*

DRAWING RECOGNIZING METHOD

PUB. NO.: 61-070675 [JP 61070675 A]

PUBLISHED: April 11, 1986 (19860411)

INVENTOR(s): YOSHIIE HIDEO

APPLICANT(s): MITSUBISHI ELECTRIC CORP [000601] (A Japanese Company or Corporation), JP (Japan)

APPL. NO.: 59-192260 [JP 84192260]

FILED: September 13, 1984 (19840913)

JOURNAL: Section: P, Section No. 488, Vol. 10, No. 241, Pg. 48, August 20, 1986 (19860820)

ABSTRACT

PURPOSE: To recognize a free-hand drawing as a fair drawing in a short time by reading a graphic form which is drawn in different colors according to the direction of a graphic line, curve / straight line difference through color FAX, and correcting a wrong recognition part...

...CONSTITUTION: The free-hand drawing which has horizontal lines in blue, vertical lines in red, slanting lines in green, and circles in black is inputted to the color FAX. Then, run length data and color data on each raster only for colored picture elements are generated and then dot array data is generated. A part where dots of the same color are arranged is recognized as one line on the basis of dot array data and the kind of the line is checked from the color of the line; when the line is not an arc, the line is converted into a straight line connecting both end points and when it is arc, a center point and a radius are calculated from both end points and the point in the middle to generate a recognized graphic form. Then, a connection between the end point of a pattern 45b and a terminal point (e) is made by interactive processing with a CPU through...

20/3,K/4 (Item 4 from file: 347)

DIALOG(R)File 347:JAPIO

(c) 2004 JPO & JAPIO. All rts. reserv.

01722985 \*\*Image available\*\*

HANDWRITTEN CHARACTER RECOGNIZING DEVICE

PUB. NO.: 60-201485 [JP 60201485 A]

PUBLISHED: October 11, 1985 (19851011)

INVENTOR(s): UCHIMURA KENICHIRO

HIGUCHI KOICHI  
YAMASHITA YOSHIYUKI  
APPLICANT(s): OKI ELECTRIC IND CO LTD [000029] (A Japanese Company or  
Corporation), JP (Japan)  
APPL. NO.: 59-057419 [JP 8457419]  
FILED: March 27, 1984 (19840327)  
JOURNAL: Section: P, Section No. 434, Vol. 10, No. 57, Pg. 152, March  
07, 1986 (19860307)

**HANDWRITTEN CHARACTER RECOGNIZING DEVICE**

**ABSTRACT**

PURPOSE: To attain character **recognition** of a **form** with high precision by extracting a slope of a character stroke from a character sample of a writer at each form and dividing the inside...  
... section 6 applies vertical scanning to a pattern register 2 so as to extract a vertical sub-pattern VSP from the relation between the consecutive **length** of black bit and the **line** width calculated at a **line** width calculation section 3. Similarly, a horizontal sub-pattern HSP, a right slope sub-pattern RSP and a left slpe sub-pattern LSP are extracted...

20/3,K/5 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

011175916 \*\*Image available\*\*  
WPI Acc No: 1997-153841/199714  
XRPX Acc No: N97-127139

Handwritten figures recognition appts - has calculation unit that  
determines feature point probability of sample point of attention as  
angle between two vectors

Patent Assignee: NEC CORP (NIDE )

Inventor: SHIRAKAWA T

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 5606629 | A    | 19970225 | US 94340384 | A    | 19941115 | 199714 B |

Priority Applications (No Type Date): JP 93313965 A 19931122

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC    | Filing Notes |
|------------|------|-----|----|-------------|--------------|
| US 5606629 | A    |     | 14 | G06K-009/48 |              |

Handwritten figures recognition appts...

...Abstract (Basic): in a position data memory. The unit is also used for selecting feature points from sample points in accordance with the feature point probability. A **line** type decision unit decides for each feature point, whether a **line** segment between the feature point and a next feature point is a **straight line** segment or an **arc** of a circle. A figure shape decision unit decides a figure shape of the figure of **line** input from the picture input unit, in accordance with the output of the calculation unit of a feature point probability and the **line** type decision unit...

...vector of the two vectors starting from a newest sample point of sample points which are older than a sample point of attention having a **distance** larger than a set value La...

...USE/ADVANTAGE - For recognition handwritten figures entered via digitiser or tablet. Effective elimination of noise interference to train points...

20/3,K/6 (Item 2 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

007332576

WPI Acc No: 1987-329583/198747

XRPX Acc No: N87-246675

Character recognition with variable subdivision of character region -  
defining code assigned character image, forming collection of input  
histograms for input character and comparing with known characters

Patent Assignee: RICOH KK (RICO )

Inventor: SATO G

Number of Countries: 003 Number of Patents: 005

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| GB 2190778 | A    | 19871125 | GB 8711738  | A    | 19870519 | 198747 B |
| DE 3716787 | A    | 19871126 | DE 3716787  | A    | 19870519 | 198748   |
| US 4903312 | A    | 19900220 | US 88241825 | A    | 19880906 | 199014   |
| GB 2190778 | B    | 19900425 |             |      |          | 199017   |
| DE 3716787 | C    | 19900906 |             |      |          | 199036   |

Priority Applications (No Type Date): JP 86251537 A 19861022; JP 86114042 A 19860519; JP 86249159 A 19861020; JP 85249159 A 19851020

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC | Filing Notes |
|------------|------|-----|----|----------|--------------|
| GB 2190778 | A    |     | 51 |          |              |
| US 4903312 | A    |     | 49 |          |              |

...Abstract (Basic): histograms of registered, known characters (5) and the one having the greatest similarity identifies the input character (6). The similarity is determined by calculating a distance between the histograms of the input character and the histograms of each of the registered characters. The binary character image is subjected to line-broadening processing, (1) prior to the step of assigning the codes...

...Abstract (Equivalent): USE/ADVANTAGE - Badly formed and handwritten signs can be recognised. Suitable for data processing systems. (49pp)

...Abstract (Equivalent): A character recognising method, comprising the steps of: optically reading an input character to be recognised to form a binary character image including at least one character line comprised of black pixels; broadening said character line in accordance with a predetermined manner; assigning a plurality of first features, different from one another, to pixels defining a contour of said binary character...

...Abstract (Equivalent): collection of similar histograms, and the one having a greatest similarity is selected to identify the input character. The similarity is determined by calculating a distance between the histograms of the input character and the histograms of the each of the registered characters. Preferably, the binary character image is subjected to line-broadening processing prior to the step of assigning the codes...

?

22/3,K/1 (Item 1 from file: 347)  
DIALOG(R)File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

03445179 \*\*Image available\*\*

LINE DRAWING CHARACTERISTIC EXTRACTION AND RECOGNITION METHOD

PUB. NO.: 03-108079 [JP 3108079 A]  
PUBLISHED: May 08, 1991 (19910508)  
INVENTOR(s): NISHIDA HIROFUMI  
APPLICANT(s): RICOH CO LTD [000674] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 01-245507 [JP 89245507]  
FILED: September 21, 1989 (19890921)  
JOURNAL: Section: P, Section No. 1234, Vol. 15, No. 305, Pg. 137,  
August 05, 1991 (19910805)

LINE DRAWING CHARACTERISTIC EXTRACTION AND RECOGNITION METHOD

ABSTRACT

PURPOSE: To facilitate the recognition processing and the recognition rate by analyzing the structure of a singular point of a curve so as to extract a simulating stroke flow of the curve thereby attaining the analysis of a hand - written line graph close to the intuition of human being...

...CONSTITUTION: A skeleton line extraction section 12 receives digital picture information from a picture input section 11 to extract a skeleton line and a line drawing structure analysis section 13 selects a point to be a singular point in which the number of connected line elements of the skeleton line is  $\geq 3$ , the singular point depending on its structure is decomposed to obtain plural stroke components. Then a matching section 14 takes matching with a standard model registered by a line drawing model section 15 depending on the structure of the singular point obtained by the analysis section 13 and the relation of connection of the stroke components thereby recognizing the inputted line drawing. Thus, the simulating stroke flow of a curve is extracted by the analysis of the structure of the singular point in such a way to approach the method of the off- line recognition to the method of on- line , the recognition is facilitated and the recognition rate is improved.

22/3,K/2 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

015067674 \*\*Image available\*\*

WPI Acc No: 2003-128190/200312

XRFX Acc No: N03-101786

Scribble shape recognition method for pen-based computer system,  
involves determining number of points, curved and straight sides in  
scribble

Patent Assignee: GOLDFOOT J (GOLD-I)

Inventor: GOLDFOOT J

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No      | Kind | Date     | Applicat No   | Kind | Date     | Week     |
|----------------|------|----------|---------------|------|----------|----------|
| US 20020146175 | A1   | 20021010 | US 2001782445 | A    | 20010212 | 200312 B |

Priority Applications (No Type Date): US 2001782445 A 20010212



Patent Details:

Patent No Kind Lan Pg Main IPC Filing Notes  
US 20020146175 A1 23 G06K-009/00

Scribble shape recognition method for pen-based computer system,  
involves determining number of points, curved and straight sides in  
scribble

Abstract (Basic):

... The scribble is recognized as a line segment when exactly  
two points are present. The scribble is recognized as closed plane  
figure , when there are more than two points and the number of  
straight sides are greater. The scribble is recognized as a  
spline or a closed spline when the number of curved sides are  
greater.

... 3) Curve or line segment identification method...

...Quickly identifies the shape of the scribble and reduces the memory  
required to store a user's drawing, by identifying the important points  
and determining the number of curved and straight edges in the  
scribble...

...The figure shows a flow chart illustrating shape recognition process

...Title Terms: CURVE ; STRAIGHT ;

22/3,K/3 (Item 2 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

009298518 \*\*Image available\*\*  
WPI Acc No: 1992-425927/199252  
XRPX Acc No: N92-324979

Image recognition method - characterising and comparing images on basis  
of internal structure, independent of image size and image orientation

Patent Assignee: TECHNIBUILD INC (TECH-N)

Inventor: PAWLICKI J A; WALCH M A

Number of Countries: 011 Number of Patents: 007

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| EP 519737  | A2   | 19921223 | EP 92305646 | A    | 19920619 | 199252 B |
| AU 9218372 | A    | 19921224 | AU 9218372  | A    | 19920618 | 199309   |
| CA 2071599 | A    | 19921220 | CA 2071599  | A    | 19920618 | 199316   |
| US 5267332 | A    | 19931130 | US 91717430 | A    | 19910619 | 199349   |
|            |      |          | US 9349658  | A    | 19930420 |          |
| AU 648001  | B    | 19940331 | AU 9218372  | A    | 19920618 | 199418   |
| TW 235351  | A    | 19941201 | TW 92104737 | A    | 19920805 | 199507   |
| EP 519737  | A3   | 19940119 | EP 92305646 | A    | 19920619 | 199517   |

Priority Applications (No Type Date): US 91717430 A 19910619; US 9349658 A  
19930420

Patent Details:

Patent No Kind Lan Pg Main IPC Filing Notes  
EP 519737 A2 E 69 G06K-009/68

Designated States (Regional): CH DE FR GB IT LI

US 5267332 A 62 G06K-009/44 Cont of application US 91717430  
AU 648001 B G06K-009/46 Previous Publ. patent AU 9218372  
AU 9218372 A G06K-009/46  
CA 2071599 A G06K-009/68

TW 235351 A G06F-015/02  
EP 519737 A3 G06K-009/68

...Abstract (Basic): USE/ADVANTAGE - For recognition of handwritten characters. Highly efficient...

...Abstract (Equivalent): or test image, is compared to the images stored in the library until a match is found. The image is represented in memory as nodes, lines, and curves. A number of descriptors, called reference keys and reference series, are generated for both the reference images and the test image. The reference library is...

...the portion of the test image actually matched to the reference image is computed. Searching criteria, like the screening criteria are based on internal image structure, so that the recognition process is independent of image size and image orientation...

22/3,K/4 (Item 3 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

004371121

WPI Acc No: 1985-197999/198533

XRPX Acc No: N85-148590

On- line pattern recognition for hand - written shapes - uses table and pen connected to computer containing dictionary of coded shapes

Patent Assignee: HITACHI LTD (HITA )

Inventor: HIRASAWA K; KUZUNUKI S; SHOJIMA H

Number of Countries: 004 Number of Patents: 004

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| EP 151316  | A    | 19850814 | EP 84116399 | A    | 19841227 | 198533 B |
| US 4653107 | A    | 19870324 | US 84686001 | A    | 19841224 | 198714   |
| EP 151316  | B1   | 19921007 | EP 84116399 | A    | 19841227 | 199241   |
| DE 3485953 | G    | 19921112 | DE 3485953  | A    | 19841227 | 199247   |
|            |      |          | EP 84116399 | A    | 19841227 |          |

Priority Applications (No Type Date): JP 83249704 A 19831226

Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|-----------|------|-----|----|----------|--------------|
|-----------|------|-----|----|----------|--------------|

|           |   |   |    |  |  |
|-----------|---|---|----|--|--|
| EP 151316 | A | E | 23 |  |  |
|-----------|---|---|----|--|--|

Designated States (Regional): DE FR GB

|           |    |   |    |             |  |
|-----------|----|---|----|-------------|--|
| EP 151316 | B1 | E | 28 | G06K-009/80 |  |
|-----------|----|---|----|-------------|--|

Designated States (Regional): DE FR GB

|            |   |  |  |             |                           |
|------------|---|--|--|-------------|---------------------------|
| DE 3485953 | G |  |  | G06K-009/80 | Based on patent EP 151316 |
|------------|---|--|--|-------------|---------------------------|

On- line pattern recognition for hand - written shapes -

...Abstract (Basic): successively and the coordinate positions along the strokes are recorded. The coordinate information of each stroke is used to regenerate the stroke in terms of straight line segments or curved line segments. The angle of each of the segment is classified into one of 32 predetermined directions by a quantisation mechanism which produces a chain of straight line segments at given angles. A normalising mechanism detects the presence or absence of connections between segments. The normalised sequence and their interconnections are rearranged to conform to a predetermined line segment chain and connection sequence...

...recognition is made by comparing the rearranged chain with a dictionary

of stored chains. Should the comparison produce a mismatch the first and the last **line** segments of the chain are detected and recognition is attempted once more. Further attempts are made by adding the coordinates of the current stroke to...

...Abstract (Equivalent): An on- **line** **recognition** method for a **handwritten** pattern comprising the steps of: sampling (20) successively coordinate information of strokes of a handwritten pattern; segmenting (30) the coordinate information of a stroke into **line** segments consisting of at least either of **straight line** segments or **curved line** segments; quantising (40) of the segments by assigning direction code values to the segments so that the direction of the **line** connecting start and end points of each segment is classified as being within one of predetermined ranges of angles to the x-axis; characterised in...

...between start or end points of the segments and preparing a connection list (L3) which indicates these connections; rearranging (60) the order of successively quantised **line** segments by selecting one segment which has a lowest end point x-coordinate value from said listed segments and arranging the order of the quantised...

...the input pattern and the readout dictionary pattern by comparing both on the basis of the direction codes and the rearranged order of the quantised **line** segments in the code list (L4), to thereby recognise the input pattern. (Dwg. 3/14i

...Abstract (Equivalent): unit to prepared pattern coordinate data. Based on an area encircled by segments created by the sampled pattern coordinate data of one stroke, and a **line** connecting a start point and an end point of the one-stroke coordinate data, the sampled pattern coordinates data of the one stroke is converted to a **straight line** and/or **curved line** segments. The converted segments are quantised and normalised. The segments of the normalised input pattern are rearranged so that the input pattern is drawn in...

...ADVANTAGE - Absorbs vibration in **handwritten** pattern and **recognises** independently of number of strokes. (21pp)a

Title Terms: ON- **LINE** ;

?

23/3,K/1 (Item 1 from file: 347)  
DIALOG(R) File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

04008258 \*\*Image available\*\*  
FACSIMILE

PUB. NO.: 04-373358 [JP 4373358 A]  
PUBLISHED: December 25, 1992 (19921225)  
INVENTOR(s): SANO KOJI  
APPLICANT(s): NEC CORP [000423] (A Japanese Company or Corporation), JP  
(Japan)  
APPL. NO.: 03-150775 [JP 91150775]  
FILED: June 24, 1991 (19910624)  
JOURNAL: Section: E, Section No. 1368, Vol. 17, No. 257, Pg. 13, May  
20, 1993 (19930520)

#### ABSTRACT

... the case of setting the originals simultaneously by attaching the specified top sheets to the respective originals even when those originals differ the destinations by **recognizing** the **handwritten** phone number of the top sheet and executing the automatic transmission...

... number of the destination is handwritten in a handwritten phone number input area 12 of a top sheet 10 having a specified format, and a **distance** a from the top of the top sheet 10 to the handwritten phone number input area 12 is printed in a simplified bar code area 11 in the form of a bar code. A simplified bar code discrimination part 2 reads the **distance** a in the simplified bar code area 11, the handwritten phone number input area 12 is detected according to the **distance** a and the area is fetched as image data from a read head 1. Next, these image data are recognized as phone codes by a **handwritten** character/ **figure** **recognition** part 3, and a dial transmission part 4 executes automatic transmission.

23/3,K/2 (Item 2 from file: 347)  
DIALOG(R) File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

03627876 \*\*Image available\*\*  
**HANDWRITTEN FIGURE RECOGNIZING SYSTEM**

PUB. NO.: 03-290776 [JP 3290776 A]  
PUBLISHED: December 20, 1991 (19911220)  
INVENTOR(s): OBARA KAZUHIRO  
ISHIKAWA TSUTOMU  
APPLICANT(s): NIPPON TELEGR & TELEPH CORP <NTT> [000422] (A Japanese Company or Corporation), JP (Japan)  
APPL. NO.: 02-092069 [JP 9092069]  
FILED: April 09, 1990 (19900409)  
JOURNAL: Section: P, Section No. 1330, Vol. 16, No. 123, Pg. 152,  
March 27, 1992 (19920327)

#### **HANDWRITTEN FIGURE RECOGNIZING SYSTEM**

#### ABSTRACT

... improve the rate of recognition by using a neural network in comparatively small scale by applying a real number value corresponding to an inter-pattern **distance** between the standard pattern of a feature

amount and an input pattern as a teacher signal for individual learning and recognizing a figure by synthesizing those outputs...

...The lateral and longitudinal density frequency distributions of a source image 6 of the input figure are respectively supplied to lateral and longitudinal inter-pattern distance calculation parts 12 and 13, and the inter-pattern distance between lateral and longitudinal average frequency distributions 7 and 8 as the standard patterns is calculated. As the teacher signal for individual learning, the maximum...

... answer, and the real number value close to the maximum value is applied to a neuron corresponding to the figure of the small inter-pattern distance. Then, the real number value close to the minimum value is applied to a neuron corresponding to the figure of the large inter-pattern distance, and the figure is recognized by synthesizing the outputs of the plural neural networks. Thus, the rate of recognition can be improved by using the neural network in the comparatively...

23/3,K/3 (Item 3 from file: 347)  
DIALOG(R)File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

03261194 \*\*Image available\*\*  
HANDWRITTEN CHARACTER RECOGNIZING METHOD

PUB. NO.: 02-236694 [JP 2236694 A]  
PUBLISHED: September 19, 1990 (19900919)  
INVENTOR(s): KURAKAKE MASAHARU  
APPLICANT(s): NIPPON TELEGR & TELEPH CORP <NTT> [000422] (A Japanese Company or Corporation), JP (Japan)  
APPL. NO.: 01-056181 [JP 8956181]  
FILED: March 10, 1989 (19890310)  
JOURNAL: Section: P, Section No. 1140, Vol. 14, No. 554, Pg. 119, December 10, 1990 (19901210)

HANDWRITTEN CHARACTER RECOGNIZING METHOD

#### ABSTRACT

...CONSTITUTION: A distance calculating part 4, which compares a recognition objective character pattern with a non-linear generated model at every character category of a memory 3, of...

... a parameter, that stores the non-linear generated model structure from plural samples at every character category by obtaining the parameter beforehand, and calculates the distance, is provided. Further the form of the generated model is obtained by combining a non-linear mean pattern reference type and a non-linear self-regression type, and based on the data obtained at every character category beforehand, an optimal structure/parameter value is determined by a statistic evaluation reference. Further the distance of the recognition objective character pattern up to each character category is defined as the deviation of each character category from the non-linear generated...

23/3,K/4 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

011518366 \*\*Image available\*\*

WPI Acc No: 1997-494852/199746

XRPX Acc No: N97-412016

Handwritten character recognition apparatus - has handwritten character recognition unit which recognises handwritten character by comparing pattern of combined unit vectors and character stored in input character memory

Patent Assignee: VICTOR CO OF JAPAN (VICO )

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| JP 9231313 | A    | 19970905 | JP 9661830  | A    | 19960222 | 199746 B |

Priority Applications (No Type Date): JP 9661830 A 19960222

Patent Details:

| Patent No  | Kind | Lan | Pg | Main IPC    | Filing Notes |
|------------|------|-----|----|-------------|--------------|
| JP 9231313 | A    |     | 5  | G06K-009/62 |              |

Handwritten character recognition apparatus...

...has handwritten character recognition unit which recognises handwritten character by comparing pattern of combined unit vectors and character stored in input character memory

...Abstract (Basic): character is done. The input character is stored in an input character memory (4). The character stored in the memory is divided into several constant length unit vectors by unit vector forming units (6,7). The unit vectors are stored in a unit vector memory (5...

...The unit vectors are combined and stored in a registration character pattern memory (8). A handwritten character recognition unit (9) recognises the handwritten character by comparing the pattern of the combined unit vectors stored in the registration character pattern memory and the character stored in the input character...

...ADVANTAGE - Reliably recognises input handwritten character. Simplifies structure of handwritten character recognition apparatus since handwritten character can be recognised by just combining constant length unit vectors...

23/3,K/5 (Item 2 from file: 350)

DIALOG(R)File 350:Derwent WPIX

(c) 2004 Thomson Derwent. All rts. reserv.

011319717 \*\*Image available\*\*

WPI Acc No: 1997-297621/199727

Related WPI Acc No: 1993-379555; 1995-336633; 1995-382677; 1996-370973; 1996-370974; 1997-086939; 1997-201779; 1997-235483; 1997-271615

XRPX Acc No: N97-245975

Object open shape end point connecting - identifying link on object, that is intersection point on object where open shape will connect to object

Patent Assignee: APPLE COMPUTER INC (APPY )

Inventor: BOZINOVIC R; PAGALLO G

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| US 5633955 | A    | 19970527 | US 92889216 | A    | 19920527 | 199727 B |
|            |      |          | US 931122   | A    | 19930105 |          |
|            |      |          | US 931123   | A    | 19930105 |          |

US 94180559 A 19940112  
US 95456247 A 19950531

Priority Applications (No Type Date): US 94180559 A 19940112; US 92889216 A 19920527; US 931122 A 19930105; US 931123 A 19930105; US 95456247 A 19950531

Patent Details:

| Patent No  | Kind | Lan | Pg          | Main IPC | Filing Notes   |
|------------|------|-----|-------------|----------|--|
| US 5633955 | A    | 46  | G06K-009/00 |          | CIP of application US 92889216<br>CIP of application US 931122<br>CIP of application US 931123<br>Div ex application US 94180559<br>Div ex patent US 5452371 |

...Abstract (Basic): shape and an object by the interaction of a pointer with a display screen of a computer system. The end point lies within a predefined distance of the object. The open shape has a number of segments including an end segment. The latter is a terminal portion of the open shape...

...USE/ADVANTAGE - In graphical user interface. Capable of recognition of hand drawn shapes on screen of pen based computer system...

23/3,K/6 (Item 3 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

008606958 \*\*Image available\*\*  
WPI Acc No: 1991-110988/199116  
XRPX Acc No: N91-085624

Multi-scale recogniser for hand drawn strokes - using combination of stroke length , stroke angle and successive filtering to match input strokes to known strokes

Patent Assignee: IBM CORP (IBMC )

Inventor: LIPSCOMB J S

Number of Countries: 006 Number of Patents: 004

Patent Family:

| Patent No  | Kind | Date     | Applicat No | Kind | Date     | Week     |
|------------|------|----------|-------------|------|----------|----------|
| EP 422403  | A    | 19910417 | EP 90117622 | A    | 19900913 | 199116 B |
| CA 2022071 | A    | 19910414 |             |      |          | 199126   |
| US 5038382 | A    | 19910806 | US 89421211 | A    | 19891013 | 199134   |
| EP 422403  | A3   | 19921202 | EP 90117622 | A    | 19900913 | 199343   |

Priority Applications (No Type Date): US 89421211 A 19891013

Patent Details:

| Patent No | Kind | Lan | Pg | Main IPC | Filing Notes |
|-----------|------|-----|----|----------|--------------|
| EP 422403 | A    |     |    |          |              |

Designated States (Regional): DE FR GB IT

Multi-scale recogniser for hand drawn strokes...

...using combination of stroke length , stroke angle and successive filtering to match input strokes to known strokes

...Abstract (Basic): Matches which occur at the same level of filtering (S3, part3) have priority over matches at different filter levels (S3, part 1). Stroke lengths are also used with different lengths being classed as short, medium and long...

...USE/ADVANTAGE - Handwriting recognition combines angle filtering

iwth multiple scales to recognise geometric shapes . (28pp  
Dwg.No.2/22)  
...Abstract (Equivalent): The handwritten character recognition appts.  
a circuit for sampling a known handwritten character. N filters are  
provided where n is an integer greater than or equals 2, with the...  
...Title Terms: LENGTH ;

23/3,K/7 (Item 4 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

007512579 \*\*Image available\*\*  
WPI Acc No: 1988-146512/198821  
XRPX Acc No: N88-111789

Handwriting symbol recognition - uses TV monitor to scan symbols and  
produce corresp. pulses for input to time interval generators  
Patent Assignee: MOSC COMMUN ENG (MOCO-R)  
Inventor: CHERNENKOV V N; ULYANOV V N; ZUBAREV Y U B  
Number of Countries: 001 Number of Patents: 001  
Patent Family:  
Patent No Kind Date Applicat No Kind Date Week  
SU 1348870 A 19871030 SU 3549929 A 19830208 198821 B

Priority Applications (No Type Date): SU 3549929 A 19830208  
Patent Details:  
Patent No Kind Lan Pg Main IPC Filing Notes  
SU 1348870 A 3

Handwriting symbol recognition -

...Abstract (Basic): The method entails converting the reference time  
interval into a series of tone intervals of varying length to improve  
fidelity. The image of the hand-written symbols is scanned and then  
converted into a series of pulses via the TV monitor (1...

...USE/ADVANTAGE - For automated systems, partic. data input obtained from  
the analysis of hand - written forms . Bul.40/ 30.10.87...  
?



27/3,K/1 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

014997477 \*\*Image available\*\*  
WPI Acc No: 2003-057992/200305  
Related WPI Acc No: 2002-697941; 2003-016123  
XRPX Acc No: N03-045012

Hand - drawn entry recognition method for digital and graphic devices, involves comparing hand-written entry's dimensions with set of recognition rules

Patent Assignee: JAEGER D (JAEG-I)

Inventor: JAEGER D

Number of Countries: 001 Number of Patents: 001

Patent Family:

| Patent No      | Kind | Date     | Applicat No   | Kind | Date     | Week     |
|----------------|------|----------|---------------|------|----------|----------|
| US 20020141643 | A1   | 20021003 | US 2001785049 | A    | 20010215 | 200305 B |

Priority Applications (No Type Date): US 2001785049 A 20010215

Patent Details:

| Patent No      | Kind | Lan Pg | Main IPC    | Filing Notes |
|----------------|------|--------|-------------|--------------|
| US 20020141643 | A1   | 49     | G06K-009/00 |              |

Hand - drawn entry recognition method for digital and graphic devices, involves comparing hand-written entry's dimensions with set of recognition rules

Abstract (Basic):

... The hand-drawn entries are received as multiple sequential points. The size of each hand-drawn entry is compared with a predetermined size range and the number and angles of vertices in a line, drawn between the points in a line are determined. The result obtained by the determination is compared with a set of recognition rules and the shape of the hand - drawn entry is identified, upon a favorable compression result.

... Enables recognizing hand - drawn objects in real-time, regardless of the screen size, allows user to customize equipment's operation, to suit their style and working at high speed and accuracy, by using the set of recognition rules to identify the hand - drawn entry's shape...

International Patent Class (Main): G06K-009/00

27/3,K/2 (Item 2 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2004 Thomson Derwent. All rts. reserv.

014254818 \*\*Image available\*\*  
WPI Acc No: 2002-075518/200210  
XRPX Acc No: N02-055667

Method for processing document, recorded medium on which document processing program is recorded and document processor for overlapping characters

Patent Assignee: JAPAN SCI & TECHNOLOGY CORP (NISC-N); NAKAGAWA M (NAKA-I)

Inventor: NAKAGAWA M

Number of Countries: 006 Number of Patents: 005

Patent Family:

| Patent No    | Kind | Date     | Applicat No   | Kind | Date     | Week     |
|--------------|------|----------|---------------|------|----------|----------|
| WO 200193188 | A1   | 20011206 | WO 2001JP4673 | A    | 20010601 | 200210 B |

EP 1310904 A1 20030514 EP 2001936835 A 20010601 200333  
 WO 2001JP4673 A 20010601  
 US 20030113019 A1 20030619 WO 2001JP4673 A 20010601 200341  
 US 2003276329 A 20030131  
 JP 2002500323 X 20030826 WO 2001JP4673 A 20010601 200357  
 JP 2002500323 A 20010601  
 EP 1310904 A9 20040128 EP 2001936835 A 20010601 200409  
 WO 2001JP4673 A 20010601

Priority Applications (No Type Date): JP 2000166025 A 20000602

# Patent Details:

Patent No Kind Lan Pg Main IPC Filing Notes

WO 200193188 A1 J 71 G06K-009/20

Designated States (National): JP US

Designated States (Regional): DE FR GB IT

EP 1310904 A1 E G06K-009/20 Based on patent WO 200193188

Designated States (Regional): DE FR GB IT

US 20030113019 A1 G06K-009/00

JP 2002500323 X G06K-009/20 Based on patent WO 200193188

EP 1310904 A9 E G06K-009/20 Based on patent WO 200193188

Designated States (Regional): DE FR GB IT

# Abstract (Basic):

... Document is read, converted into electronic character box data (S2) which is stored (S3). For character detection (S5), data is contracted, small points are removed, and remaining pattern is reversely expanded to produce character data. To detect entry box (S4), entry box position data is generated from character...

... Method for processing document, recorded medium on which document processing program is recorded and document processor for overlapping characters, to recognize characters, handwritten form

International Patent Class (Main): G06K-009/00 ...

27/3,K/3 (Item 3 from file: 350)

DIALOG(R) File 350:Derwent WPIX

(c) 2004 Thomson Derwent. All rts. reserv.

011074657 \*\*Image available\*\*

WPI Acc No: 1997-052581/199705

XRPX Acc No: N97-043074

Real time handwriting recognition system - has cluster recogniser to maintain time ordered current stroke buffer and previous stroke buffer and construct per stroke area of influence list

Patent Assignee: WANG LAB INC (WANG )

Inventor: JOURJINE A; JOURJINE A N

Number of Countries: 021 Number of Patents: 006

# Patent Family:

| Patent No   | Kind | Date     | Applicat No | Kind | Date     | Week     |
|-------------|------|----------|-------------|------|----------|----------|
| WO 9641300  | A1   | 19961219 | WO 96US4156 | A    | 19960327 | 199705 B |
| AU 9653745  | A    | 19961230 | AU 9653745  | A    | 19960327 | 199716   |
| EP 774141   | A1   | 19970521 | EP 96910590 | A    | 19960327 | 199725   |
|             |      |          | WO 96US4156 | A    | 19960327 |          |
| JP 10504126 | W    | 19980414 | WO 96US4156 | A    | 19960327 | 199825   |
|             |      |          | JP 97500451 | A    | 19960327 |          |
| AU 699966   | B    | 19981217 | AU 9653745  | A    | 19960327 | 199911   |
| US 5991441  | A    | 19991123 | US 95476826 | A    | 19950607 | 200002   |

Priority Applications (No Type Date): US 95476826 A 19950607

# Patent Details:

| Patent No  | Kind | Lang | Pg  | Main IPC    | Filing Notes                     |
|--|------|------|-----|-------------|----------------------------------|
| WO 9641300   | A1   | E    | 200 | G06K-009/22 |                                  |
| Designated States (National): AU CA JP   |      |      |     |             |                                  |
| Designated States (Regional): AT BE CH DE DK ES FI FR GB GR IE IT LU MC NL PT SE |      |      |     |             |                                  |
| AU 9653745   | A    |      |     | G06K-009/22 | Based on patent WO 9641300       |
| EP 774141  | A1   | E    | 200 | G06K-009/22 | Based on patent WO 9641300       |
| Designated States (Regional): DE FR GB   |      |      |     |             |                                  |
| JP 10504126  | W    |      | 203 | G06K-009/62 | Based on patent WO 9641300       |
| AU 699966  | B    |      |     | G06K-009/22 | Previous Publ. patent AU 9653745 |
| Based on patent WO 9641300   |      |      |     |             |                                  |
| US 5991441   | A    |      |     | G06K-009/00 |                                  |

Real time handwriting recognition system...

...Abstract (Basic): tablet and pen. An input cluster buffer stores stroke descriptor information of a current stroke as the current stroke is entered by the user. A point buffer stores the stroke descriptor information of the current stroke. The stroke descriptor information of the current stroke is transferred into the point buffer...

...A stroke feature recogniser extracts features from the descriptor information of the current stroke and assigns a meaning to the current stroke. A cluster recogniser recognises and assigns a character meaning to...

International Patent Class (Main): G06K-009/00 ...

...International Patent Class (Additional): G06K-009/46

27/3,K/4 (Item 4 from file: 347)

DIALOG(R)File 347:JAPIO

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05532252 \*\*Image available\*\*

ON-LINE HAND - WRITTEN CHARACTER RECOGNITION METHOD AND CHARACTER DESCRIPTION METHOD FOR ON-LINE HAND - WRITTEN CHARACTER RECOGNITION

PUB. NO.: 09-147052 [JP 9147052 A]

PUBLISHED: June 06, 1997 (19970606)

INVENTOR(s): RIYUU GAKUHEI

APPLICANT(s): RICOH CO LTD [000674] (A Japanese Company or Corporation), JP (Japan)

APPL. NO.: 07-307228 [JP 95307228]

FILED: November 27, 1995 (19951127)

ON-LINE HAND - WRITTEN CHARACTER RECOGNITION METHOD AND CHARACTER DESCRIPTION METHOD FOR ON-LINE HAND - WRITTEN CHARACTER RECOGNITION

INTL CLASS: G06K-009/62; G06K-009/62; G06K-009/46

#### ABSTRACT

PROBLEM TO BE SOLVED: To reduce the size of a dictionary for on-line hand - written character recognition .

...

...SOLUTION: The stroke of an input character is normalized by the size of its bounding box, and then the quasi-phase structure is analyzed , and the stroke type of the stroke of the input character is determined by matching between this quasi-phase structure and those of fundamental strokes in a stroke dictionary 114. Stroke types of respective strokes and

coordinates of diagonal points or start and end posits of its bounding box are used to identify the character category by matching with character models in a character dictionary 16. Character models are described by stroke types of respective strokes, coordinates of diagonal points or start and end points of bounding boxes, numbers of strokes, and character codes.

27/3,K/5 (Item 5 from file: 347)  
DIALOG(R) File 347:JAPIO  
(c) 2004 JPO & JAPIO. All rts. reserv.

04352548 \*\*Image available\*\*  
FACSIMILE TRANSMISSION PAPER SHEET AND FACSIMILE EQUIPMENT PROVIDED WITH  
OCR FUNCTION

PUB. NO.: 05-344248 [JP 5344248 A]  
PUBLISHED: December 24, 1993 (19931224)  
INVENTOR(s): NANBU KEIJI  
APPLICANT(s): MATSUSHITA ELECTRIC IND CO LTD [000582] (A Japanese Company  
or Corporation), JP (Japan)  
APPL. NO.: 04-150632 [JP 92150632]  
FILED: June 10, 1992 (19920610)  
JOURNAL: Section: E, Section No. 1531, Vol. 18, No. 180, Pg. 22, March  
28, 1994 (19940328)

INTL CLASS: H04N-001/00; G06K-009/00 ; G06K-009/20; H04N-001/32

#### ABSTRACT

...CONSTITUTION: A facsimile number entry column 13 of a facsimile transmission form 11 passes an OCR sensor and the **handwritten figures** are **recognized**. An ID number entry column 14 which is collinear with the facsimile number entry column 13 passes the OCR sensor and the **handwritten figures** are **recognized**. Next, the **handwritten** characters entered in an address entry column 12 is image-inputted by an image scanner and is stored in a memory, and transmission paper sheet...

... registered in the memory from the ID number is retrieved and the transmission contents of the memory is transmitted to a transmission destination. At this point, the information by the ID number generates on the reception paper sheet.

?

Search Instructions for case 09/782,445

Note: Please print all the potential references instead of just marking them.

Key concept: Look for a method that recognize shapes/forms/figures/postures from a scribble/handrawn/handwritten by by determining the points/targets/dots and curve side and straight sides in a scribble/handrawn/hadwritten.

Key words of this search (Examiner is open to more possible key words from the searcher):

+ recognize\*/identify\*/determine\*/find\* near?? shape/figure/form/postures near??  
handwritten/handrawn/scribble/write\*

+ point/target/dot/ and curve side and straight side and spline

+Point/target/dot near?? determina\*/identify\*/recogni\*/ near?? distance/length near??  
threshold/predetermine length

ATT: My SPE hereby authorized the Examiner to request for 24 hrs. search.

Amelia Au

against stroke connections (stroke number variations) while maintaining a reasonable degree of robustness against stroke order variations. The proposed algorithm RAV has several important features; (i) Raw data consisting of pen position trajectory is transformed into angle variation and resampled in a simple but very effective manner, (ii) A special distance function is proposed to evaluate distance between two characters taking into account the angle variations as well as pen up/down variations, and (iii) An automatic dictionary generation scheme is proposed...

DESCRIPTORS: handwritten character recognition ;  
...BROADER DESCRIPTORS: figure pattern recognition ;

16/3,K/3 (Item 2 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

04594464 JICST ACCESSION NUMBER: 00A0346365 FILE SEGMENT: JICST-E  
An Attempt of Individual Identification from Handwritten Characters  
Based on the Linear- and Curvilinear-Features.

SATO TSUYOSHI (1); MIYAKAWA MICHIO (2); ISHIWATA MASAMICHI (3)  
(1) Anritsu Corp.; (2) Niigata Univ.; (3) NTT Data Corp., JPN  
Denki Gakkai Ronbunshi. C(Transactions of the Institute of Electrical  
Engineers of Japan. C), 2000, VOL.120-C,NO.3, PAGE.397-403, FIG.9,  
TBL.3, REF.11

JOURNAL NUMBER: S0810AAN ISSN NO: 0385-4221  
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165  
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan  
DOCUMENT TYPE: Journal  
ARTICLE TYPE: Original paper  
MEDIA TYPE: Printed Publication

An Attempt of Individual Identification from Handwritten Characters  
Based on the Linear- and Curvilinear-Features.

...ABSTRACT: Specific features appeared in handwritten characters can be used to discriminate a person from the others without invading privacy. This paper deals with the individual identification from handwritten characters in off-line systems. An effective method to extract the specific features appeared in the straight and/or the curved part of handwritten characters is described in this paper. Our feature extraction method is based on calculation of the length and inclination of straight - lines and parameters of the circular arcs that are found in the binarized and thinned lines of the characters. Since the distribution of those specific features depends on the writer, the distribution pattern can be used for the purpose of individual...

DESCRIPTORS: handwritten character recognition ;  
...BROADER DESCRIPTORS: figure pattern recognition ;

16/3,K/4 (Item 3 from file: 94)  
DIALOG(R)File 94:JICST-EPlus  
(c)2004 Japan Science and Tech Corp(JST). All rts. reserv.

03439858 JICST ACCESSION NUMBER: 97A0987827 FILE SEGMENT: JICST-E  
On-Line Handwritten Character Recognition Based on Non-Euclidean  
Distance .

UCHIYAMA TADASU (1); SONEHARA NOBORU (1); TOKUNAGA YUKIO (1)  
(1) Nippon Telegraph & Telephone Corp., Human Interface Lab.  
Denshi Joho Tsushin Gakkai Ronbunshi. D,2(Transactions of the Institute of

## 論文

## 手書き文字の直線性と曲線性に注目した筆者識別の試み

非会員 佐藤 剛 (アンリツ)

正 員 宮川道夫 (新潟大)

非会員 石渡正倫 (NTTデータ)

An Attempt of Individual Identification from Handwritten Characters  
Based on the Linear- and Curvilinear-FeaturesTsuyoshi Satoh, Non Member (Anritsu), Michio Miyakawa, Member (Niigata University) and  
Masamichi Ishiwata, Non Member (NTT Data)

The importance of swift and correct identification of individuals is increasing as a key technology to gain access various kinds of information. Specific features appeared in handwritten characters can be used to discriminate a person from the others without invading privacy. This paper deals with the individual identification from handwritten characters in off-line systems. An effective method to extract the specific features appeared in the straight and/or the curved part of handwritten characters is described in this paper. Our feature extraction method is based on calculation of the length and inclination of straight-lines and parameters of the circular arcs that are found in the binarized and thinned lines of the characters. Since the distribution of those specific features depends on the writer, the distribution pattern can be used for the purpose of individual identification. The effectiveness of this method is examined experimentally. The result of our identification experiments enabled us to obtain an 88.4% identification average.

キーワード：手書き文字、筆者識別、オフライン、ストローク形状、類似性評価

## 1. はじめに

現代社会では、クレジットカードの利用や施設の入退室管理、さらに電子商取引等、非対面取引の増加に伴い、コンピュータを用いた迅速かつ正確な個人認識技術の確立が求められている。

個人を認識、識別する方法として、1)所有物による方法(磁気カード、ICカード等)、2)知識(記憶)による方法(パスワード)、3)身体的な特徴による方法(指紋、虹彩等)、4)行動的な特徴による方法(筆跡、声紋)などが挙げられる。1)、2)はともに簡易性に優れているが、盗難、偽造、忘失といった危険性があり、3)では心理的抵抗感が大きく、かなり高機能のハードウェアが必要になる問題点もある。本論文では、このような問題点の少ない筆跡からのオフライン個人識別手法について検討した。

筆跡の個人特徴を利用した筆者認識に関する研究<sup>(1),(2)</sup>は、入力方式により、オンライン方式とオフライン方式の二種類に大別される。オンライン方式では文字を筆記する過程の情報、すなわち、筆順や筆記速度、加速度、筆圧、あるいはペンの角度など動的な情報を個人特徴として利用できる利点がある。これに対し、既に筆記された筆跡をビデオカメラなどで取り込み、処理を行うオフライン方式は動的情報が利用できないという制約はあるが、オンライン方式で用いるような特別な入力装置を必要とせず、事後認証も

可能である。また、オフライン方式の個人識別はオンライン方式に比べて利用できる情報量が少なく、より困難である。本研究では、この意味で、より一般性に富むとも言えるオフライン入力を仮定する。オフライン方式で入力された手書き文字からの個人識別が困難なのは、動的情報が利用できないことのほか、同一人物でも文字画像にばらつきがあるためである。

このようなオフライン筆者識別の分野において、相似パターンの統計量計測に基づく吉村らの報告<sup>(3),(4)</sup>や、2次統計量の線分スペクトル分解を用いた尺長らの報告<sup>(5),(6)</sup>がある。尺長らは文字画像中にある直線パターンや平行線成分に関する情報を特徴量として使い、実験的にその有効性を検証した。さらに吉村らは尺長らの特徴量に円弧パターンの統計量を加え、曲線性を考慮することでより高精度な筆者識別が可能であると報告している。

前述の報告<sup>(3)-(6)</sup>では手書き文字の個性という観点から文字パターンの形状情報の有効性が示されているが、我々は入力情報のうち、線幅、濃度など筆記具に影響されやすい要素を最小限に抑え、ストロークの基本形状に注目した手法も可能であると考えた。すなわち、入力画像に細線化等の処理を行うことによりストロークの基本的な形状を抽出し、これを利用した筆者識別法の開発が可能であると考えた。このような形状情報はあらゆる筆記データにおける基本的な特徴であり、線の太さや濃度といった情報を含ま

ないため、筆記具などの違いによる影響も受けにくい。

ストロークの基本的な形状に現われる個人特徴のうち、その直線性に注目した個人同定手法<sup>7)</sup>はハフ変換により得られる直線情報を利用する。直線から得られる特徴としては水平方向からのその傾き、線分長のほか、勿論、直線の存在する位置も用いられる。3種類の筆記データ、すなわち、

- (a)本人署名：筆者Aによる自己氏名の筆記
- (b)単純偽筆：筆者Aの筆跡を提示せず、Aの氏名を偽筆者が筆記

(c)模倣偽筆：筆者Aの筆跡を提示し、偽筆者が模倣して筆記を用意する。(c)ではあらかじめ収集した筆者A本人の筆跡を提示し、それを見ながら良く真似るよう指示する。データ数は、

- (a)本人署名：1人の筆者から70枚
- (b)単純偽筆：50人の偽筆者から各1枚の計50枚
- (c)模倣偽筆：50人の偽筆者から各1枚の計50枚

である。(a)の筆跡から10枚をランダムに選択、本人の筆跡データベースを作成し、相互相関をベースとする評価指標を用いて筆跡全体の照合実験を行った。照合の判定基準となる閾値の決定には、データベース作成に使用されたものを除く60枚の本人署名より、ランダムに選択した10枚を利用した。選択された各筆跡とデータベースとの相互相関の平均と標準偏差を算出し、平均値と標準偏差の差をもって閾値とした。<sup>7)</sup>実験の結果、(a)~(c)各50枚のテストデータに対し、本人拒否率は平均6.8%、他人受入率は(b)で0.0%、(c)で23.6%と、単純な特徴の割には良好な成績が得られている。ただし、これは筆跡中の直線部が多い漢字で構成される筆記データを使用した場合の結果であり、直線部の少ない平仮名のような字種では抽出される個人情報が増減するため、成績が低下する。従って字種によっては直線性に関する情報だけで個人識別を行うことは難しく、より高精度な識別能力が要求されるシステムでは他の筆跡識別法と組み合わせることが求められる。この時、処理コストの増大に見合うだけの識別率向上を望むなら、互いに独立な情報をより効果的に組み合わせることが重要である。

本論文ではこの直線特徴からの個人識別手法を補完する方法として、筆跡中の曲線部に存在する個人特徴を利用した個人識別手法について検討した。また、上記の直線性に注目した個人特徴と、曲線特徴双方の特徴を利用して筆跡の類似性を評価する手法についても検討を行った。直線部、曲線部互いに独立な情報としての個人特徴を利用することにより、より精度の高い個人識別が可能になると考えられる。本研究では、筆記ストロークの基本的な形状に現われる個人の書き方特徴を筆者識別に利用した場合、どの程度の正確さが得られるかを明らかにすると共に、両特徴を組み合わせることで実際の筆者識別に利用する可能性の検討を研究の目的としている。

## 2. 筆者識別の原理

### <2.1> 個人特徴の記述

本手法では直線特徴、曲線特徴とも、線の太さ、濃度、文字と文字との位置関係等に関する情報を用いず、ストローク形状に存在する個人特徴のみを利用する。本節では筆記ストローク中に存在する個人特徴の定義と抽出法について述べる。

### <2.1.1> 前処理

入力画像は一般性に配慮して白黒濃淡画像とする。まず、2値化と細線化処理により同一筆者でもバラツキの大きい線の太さや濃度等の影響を排除し、ストローク情報を取り出す。原画像、拡大図及び細線化画像の一例を図1に示す。次に文字単位の筆跡識別を行うため、筆跡画像より個々の文字を切り出す。文字単位で識別を行う理由は、個々の文

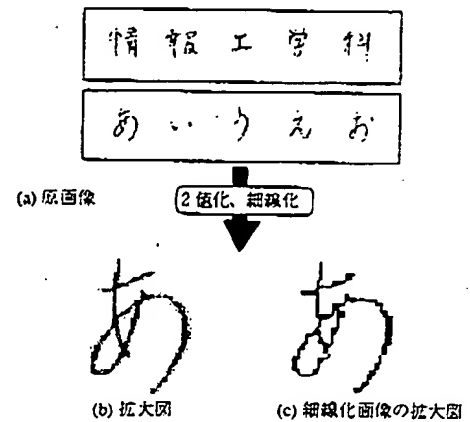


図1 入力画像例  
Fig.1 An example of input images

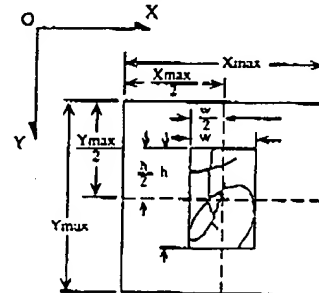


図2 位置正規化  
Fig.2 Position normalization

字の構造に依存しない個人の書き方特徴を抽出する際、文字間距離(文字バランス)などの情報を排除し、<2.1.2>、<2.1.3>に述べるストローク中の個人特徴を強調するためである。今回は筆記枠を指定して筆記データを収集したためセグメンテーションの自動化は行っておらず、入力画像の縦方向ヒストグラムを利用して分割を行った。文字ごとに分割された各文字画像は、図2に示すように、外接する矩形の縦方向、横方向の中央を基準として新たな座標へ移動するが、この時、拡大や縮小は行わない。

### <2.1.2> 頻度分布の定義

#### (1) 直線性頻度分布

前述した通り筆跡の直線部より個人情報を抽出するには、ハフ変換により得られる3次元パラメータ( $\rho$ ,  $\theta$ , 頻度値)の筆者依存性を利用する。ただし、 $\rho$ は原点から直線へおろした垂線の長さ、 $\theta$ は垂線とx軸とのなす角である。ハフ変換の描かれる平面上の各点には筆跡中に含まれる直線成分の位置、傾き、長さなど直線の状態に関する多くの情



報が含まれており、筆者固有の書き方特徴となっている。大部分の筆者は文字、特に漢字、片仮名などを傾けて書く傾向があり、我々の個人識別法はこの特徴に注目した手法である。

具体的処理には、まず画像中の黒画素 $(X_i, Y_i)$ について次式(1)で表されるハフ変換を適用する。

$$\rho = X_i \cos \theta + Y_i \sin \theta \quad (1)$$

画像中の全黒画素について上式を適用すると、 $\rho$ - $\theta$ 平面上には画素数と同数のハフ曲線が描かれる。ここで $\rho$ - $\theta$ 平面上的ハフ曲線分布を直線性頻度分布と呼び、またそのハフ曲線上の各点 $(\rho_j, \theta_j)$ を特徴点と呼ぶ。特徴点には画像中に存在する直線成分を成す黒画素数が保存されている。分

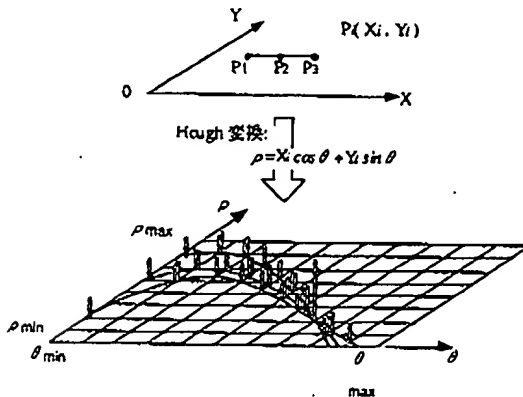


図3 直線特徴の抽出とその分布  
Fig.3 Extraction and description of the linear feature

解能 $\theta_{dis}$ で $\theta$ をその最小値 $\theta_{min}$ から最大値 $\theta_{max}$ まで変えながら入力画像のハフ変換を行う。変換後の $\rho$ の最大値を $\rho_{max}$ 、最小値を $\rho_{min}$ とすれば、次式から、ハフ曲線は $D$ 個の点集合により記述される。

$$D = (\rho_{max} - \rho_{min}) \cdot \theta_{max} / \theta_{dis} \quad (2)$$

すなわち、直線成分に関する筆者の特徴は次元数 $D$ の特徴ベクトルで表現される。処理コストを考慮しつつ $\theta$ の分解能を上げれば次元数が増し、より詳細な個人情報の抽出・分類が可能である。

## (2) 曲線性頻度分布

筆跡の曲線部に存在する個人情報として画像に適合する部分円弧のパラメータ、すなわち曲率円の中心座標 $(x, y)$ とその頻度を用いる。これは、同種の文字においても筆者毎に「文字の丸さ」が異なっており、特に平仮名でこの個人差が顕著であるという観察結果を数値化する一つの尺度である。実際本研究により、当てはめられた様々な円の中心座標とその頻度がプロットされた頻度分布には、ストロークの全体的な曲率や位置などの情報が反映されており、その情報を曲線部に存在する個人の書き方の特徴として利用できるとが確かめられた。

円を当てはめる実際の操作は、ストローク中の局所的に連結した画素の集合を処理単位として行われる。まず画像中の1点の黒画素 $P_0$ を選択し、隣接する画素を調べる。次いで隣接画素数が2個の場合のみ、隣接画素に連結した画素を最大 $N$ 個まで8連結で追跡する。2個の隣接画素を始点とした追跡操作により検出される画素の集合をそれぞれ要

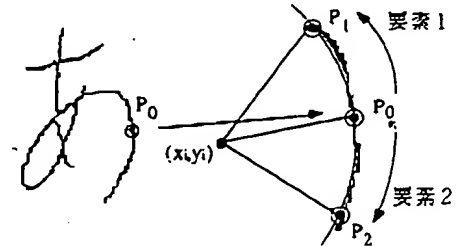


図4 曲線特徴の記述  
Fig.4 Description of the curvilinear feature

素1、要素2と呼ぶ。次に $P_0$ と要素1の点 $P_1$ 、要素2の点 $P_2$ の3点に円弧を当てはめる(図4)。要素1に含まれる各点を $P_1$ 、また、要素2に含まれる各点を $P_2$ とし、この操作を繰り返す。このときの円の中心座標 $(x_i, y_i)$ の頻度を、曲線性頻度分布としてプロットしていく。ただし、文字領域の大きさ(図4の文字「あ」のサイズは $50 \times 73$ pixel)に対し、特徴分布の領域の大きさは $150 \times 150$ pixelと平均6倍程度の領域を確保されており、円弧の中心座標はこの領域内におさまる値だけが特徴として評価される。実際の処理では画像中のすべての黒画素を $P_0$ として、 $P_0, P_1, P_2$ の3点を通る円弧を求めるが、3点が直線上に並ぶ場合や求めた中心が特徴分布領域にない場合には何もせず、次の3点の組合せを取り出し、同様な処理を繰り返す。このような処理により文字画像から曲線性頻度分布が求められる。

## <2.1.3> 個人特徴の定義

2.1.2で述べた処理により、筆跡の直線性と曲線性に関する個人特徴を含む、直線特徴および曲線特徴の頻度分布が得られる。図5に曲線特徴としての円弧の頻度分布の一例を示す。おおまかな起伏として筆者の特徴を反映した頻度分布が得られている。同時に、起伏に沿った特徴点近傍では、細かい頻度値の変動が観測できる。このノイズの要因の一つは量子化誤差である。これは入力画像がドットマトリクスで構成される以上必然的に生じるが、この対策とし

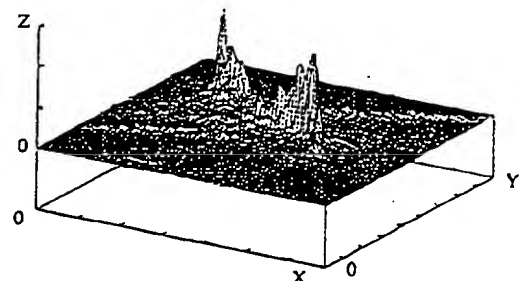


図5 曲線特徴の分布の一例  
Fig.5 An example of the curvilinear feature distribution

て一般化ハフ変換においてピーク形成精度の向上を行う手法などが報告されている。しかし本研究においては頻度値のピーク形成精度より、頻度値の分布形状の方が個人情報として重要である。そこで、処理の簡略化のため、頻度分布に対して平滑化処理を施し、処理後に得られるおおまかな起伏を個人特徴として採用する。以下では、登録者 $p$ の $k$ 番目の筆跡中の $n$ 番目の文字より抽出された直線性に関する個人特徴を、

$$SF_{p,k,n}(\rho, \theta), \\ (\rho_{\min} \leq \rho \leq \rho_{\max}, \theta_{\min} \leq \theta \leq \theta_{\max})$$

同様に、曲線性に関する個人特徴を、

$$CF_{p,k,n}(x, y), \\ (x_{\min} \leq x \leq x_{\max}, y_{\min} \leq y \leq y_{\max})$$

と表記する。

## <2.2> 識別方法

筆者の識別は、複数枚の参照用筆跡を利用した類似性評価に基づいて行われる。本節では、参照用の筆跡より登録者の平均的な特徴を記述したデータ(基準データ)を作成する方法と、類似性の評価方法について述べる。

### <2.2.1> 基準データ

同一筆者においても筆跡には若干のばらつきがあるため、基準データの設定に際してはこの変動を考慮することが重要である。つまり、筆跡の変動を考慮に入れた平均的な特徴を特定個人の基準データとして記述する必要がある。本手法では以下の手順で、複数の参照用筆跡から基準データを作成する。

まず、各参照用筆跡から、2.1で述べた方法に従って直線性および曲線性に関する個人特徴、 $SF_{p,k,n}(\rho, \theta)$ 、 $CF_{p,k,n}(x, y)$ を抽出する。ここで $p$ は登録者番号、 $k$ は参照用筆跡における筆跡番号、また $n$ は筆跡中の文字番号を示す。

次に筆者 $p$ による $K$ 個の文字についての、平均と分散を求める。直線特徴の分散値の分布を $V\_SF_{p,n}(\rho, \theta)$ 、平均値の分布を $M\_SF_{p,n}(\rho, \theta)$ 、同様に、曲線特徴の分散値の分布を $V\_CF_{p,n}(x, y)$ 、平均値の分布を $M\_CF_{p,n}(x, y)$ とすると、

$$M\_SF_{p,n}(\rho, \theta) = \frac{1}{K} \sum_{k=1}^K SF_{p,k,n}(\rho, \theta) \quad (3)$$

$$M\_CF_{p,n}(x, y) = \frac{1}{K} \sum_{k=1}^K CF_{p,k,n}(x, y) \quad (4)$$

$$V\_SF_{p,n}(\rho, \theta) = \frac{1}{K} \sum_{k=1}^K (SF_{p,k,n}(\rho, \theta) - M\_SF_{p,n}(\rho, \theta))^2 \quad (5)$$

$$V\_CF_{p,n}(x, y) = \frac{1}{K} \sum_{k=1}^K (CF_{p,k,n}(x, y) - M\_CF_{p,n}(x, y))^2 \quad (6)$$

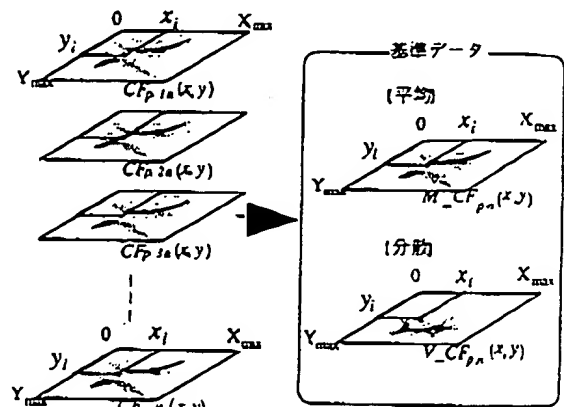


図6 基準データについて

Fig.6 Individual standard data for comparison

となる。以上の操作により基準データを作成する。この基準データ作成法を図6に示す。

### <2.2.2> 距離計算

筆者未知のテストデータと登録者ごとの基準データとの類似性評価の尺度として分散値で重み付けしたEuclid距離<sup>(6)</sup>を用い、次式により直線特徴についての距離 $SL_{p,n}$ と曲線特徴についての距離 $CL_{p,n}$ を算出する。

$$SL_{p,n} = \sum_{\rho} \sum_{\theta} \frac{\{ST_n(\rho, \theta) - M\_SF_{p,n}(\rho, \theta)\}^2}{V\_SF_{p,n}(\rho, \theta)} \quad (7)$$

$$CL_{p,n} = \sum_x \sum_y \frac{\{CT_n(x, y) - M\_CF_{p,n}(x, y)\}^2}{V\_CF_{p,n}(x, y)} \quad (8)$$

この評価方法では登録者が複数回筆記する時の、各特徴点における変動のし易さに応じて重み付けを変え、平均的な特徴間の距離を求める。ここで、評価対象となる直線特徴の次元数は、入力画像のサイズとハフ変換の分解能を考慮して $720 \times 360$ 、また曲線特徴の次元数は $150 \times 150$ である。

### <2.2.3> 総合評価

上記の処理により、直線特徴の距離 $SL_{p,n}$ と、曲線特徴の距離 $CL_{p,n}$ が求められる。これらの距離から筆跡間の総合的な類似性評価を行うが、 $SL_{p,n}$ と $CL_{p,n}$ の距離ではスケールが異なるため、距離指標統合のための工夫が必要となる。ここでは、次式の基準値により両距離を標準化する評価法<sup>(6)</sup>を用いた。すなわち、

$$L_{p,n} = \frac{SL_{p,n}}{SL_0} + \frac{CL_{p,n}}{CL_0} \quad (9)$$

として求められる $L_{p,n}$ によりテストデータと基準データとの類似性を評価する。ここで基準値としては、4.2の検討結果から最小値を採用した。すなわち $SL_0$ は $SL_{p,n}(p:1 \sim \text{登録者数})$ の最小値、同様に $CL_0$ は $CL_{p,n}$ の最小値である。式(9)により算出される距離は、直線、曲線特徴の双方において最小値を与える登録者の場合に最小値2となり、原理的には2以上の有限値を取る。

## 3. 識別実験

### <3.1> 筆跡データ

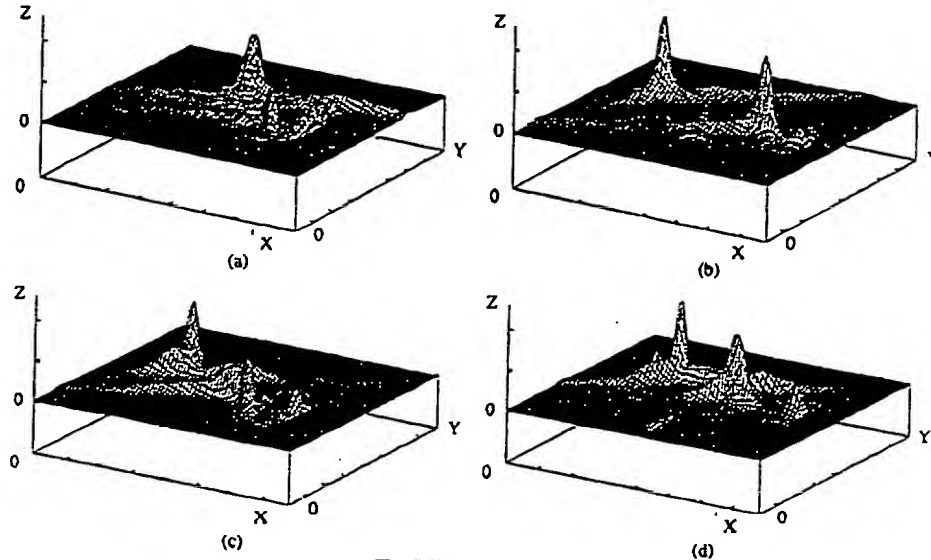


図7 曲線特徴の個人差  
Fig.7 Individual variation in curvilinear features

筆記用紙には筆記の極端な妨げとならない程度の大きさの筆跡枠を設け、枠内に筆記するよう指示した。書かれた文字は筆記用紙毎にスキャナで取り込まれるが、その解像度は170DPI(図1に示した「あ」で50×73pixel)である。入力画像から文字を切り出し、文字位置を正規化し150×150 pixelの画像平面上に再配置する。

筆記データとしては、2種5文字からなる「情報工学科」と「あいうえお」の文字列を、1日5枚の上限を設けて7人の登録者より15枚ずつ収集した筆跡を用いた。

### <3.2> 個人特徴の抽出

直線特徴を抽出する際の分解能を $\theta_{dis}=0.5^\circ$ 、また、曲線特徴抽出の処理単位となる連結要素の最大追跡数を $N=8$ としてそれぞれの特徴を抽出した。また各特徴について行う平滑化処理には、4.1の検討結果からサイズ5×5の平均値フィルタを用いた。ここで、文字「あ」について曲線性に関する個人特徴を求めた例を図7に示す。図7(a)~(d)に示す個人特徴は異なる4名の筆者のそれである。大局的には似た形状であるが、同時に筆者による違いも明瞭である。

### <3.3> 実験方法

筆者識別実験では、グループ中にテストデータの筆者が確実に存在するという仮定のもと、各登録者についてあらかじめ準備した基準データを用い、テストデータの文字ごとに筆者を識別する。テストデータが入力されると、まず、細線化など前処理を行い、文字単位に分割された各入力画像から直線性ならびに曲線性に関する特徴抽出を行う。細線化にはHildrichのオペレータ<sup>10)</sup>を用いた。各登録者の基準データと抽出された直線および曲線特徴との距離を式(9)より求め、距離が最小となる基準データの登録者を筆者と判定する。

3.1で説明したように、各登録者による筆記データが15枚ずつ存在する。今回の識別実験では、この15枚の筆記データのうち9枚をランダムに選択して基準データを作成し、残りの6枚をすべて筆者未知のテストデータとして用いた。

基準データを作成する際に用いる9個の筆記データの選

表1 平均識別精度  
Table 1 Averaged correctness of identification

| 文字  | 実験番号 | ①     | ②      | ③     | ④     | ⑤      | 平均正答率(%) |
|-----|------|-------|--------|-------|-------|--------|----------|
| 情   |      | 85.71 | 95.24  | 90.48 | 88.10 | 85.71  | 89.05    |
| 報   |      | 80.95 | 80.95  | 83.33 | 80.95 | 83.33  | 81.90    |
| 工   |      | 76.19 | 78.37  | 80.95 | 73.81 | 83.33  | 78.57    |
| 学   |      | 95.24 | 92.86  | 85.71 | 95.24 | 90.48  | 91.91    |
| 科   |      | 76.19 | 90.48  | 85.71 | 85.71 | 80.95  | 83.81    |
| あ   |      | 88.10 | 95.24  | 95.24 | 92.86 | 100.00 | 94.29    |
| い   |      | 90.48 | 92.86  | 95.24 | 92.86 | 92.86  | 92.86    |
| う   |      | 80.95 | 83.33  | 85.71 | 80.95 | 83.33  | 82.85    |
| え   |      | 85.71 | 92.86  | 95.24 | 90.48 | 100.00 | 92.86    |
| お   |      | 92.86 | 100.00 | 97.62 | 92.86 | 97.62  | 96.19    |
| 平均値 |      | 85.24 | 90.24  | 89.52 | 87.38 | 89.76  | 88.43    |

び方により、識別精度は多少変化する。5回にわたる識別実験の結果を表1に示す。7人の登録者の筆跡6枚ずつを識別対象としており、各識別実験におけるテストデータの数は42個となっている。平均正答率88.43%という結果が得られたこと、また特に比較的曲線部の多いデータ「あいうえお」についても、漢字データと同様、あるいはより良好な結果が得られたことから、筆跡の直線性と曲線性に関する個人特徴を識別に用いた本手法の有効性が確認できた。

## 4. 検討

### <4.1> 平滑化処理

直線、曲線特徴を抽出する際、頻度分布に対して平滑化処理を行った。これは頻度分布に筆者の特徴がおおまかな起伏として現われるが、細かく不規則的に発生する起伏は量子化誤差などにより生じ、識別にとってはノイズにすぎないと考えたためである。

このようなノイズの成因の具体例を図8に示す。図8で

は、2値化、および細線化処理後の画像パターンがP2で構成される場合とP2'で構成される場合の二つの場合を示している。つまり(P0,P1,P2),(P0,P1,P2')の2パターンから円中心座標を求めた場合、それぞれの中心座標が異なってい

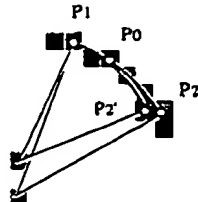


図8 量子化誤差の影響

Fig.8 The influence caused by quantization error

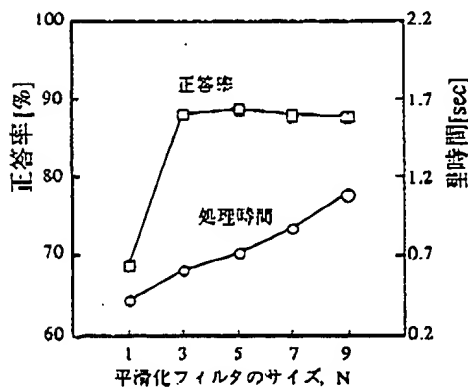


図9 平滑化処理による識別精度の変化

Fig.9 Smoothing and correct identification rates

る。この場合のP2とP2'のような違いは、入力画像がドットマトリクスで構成されるため一定の確率で必然的に生じるものであり、その対応策として平滑化処理を施した。

しかし、平滑化の程度を少しずつ強めてゆく、すなわちフィルタサイズを大きくしていくとある程度まではノイズ除去により識別精度が向上するが、一定以上のサイズでは個人特徴に関する情報も失われる可能性がある。そこでフィルタサイズを少しずつ変えて実際に筆者識別実験を行い、平滑化処理における最適フィルタサイズを決定した。平滑化には平均値フィルタを使用し、平滑化なしのサイズ1×1から2ずつフィルタサイズを拡大していき、全てのテスト文字の平均正答率、および1文字あたりの特徴抽出処理時間の変化をプロットしたのが図9である。予想通り、平滑化操作によって正答率は大きく向上するが、サイズ5×5のフィルタを頂点としてその効果は低下している。この検討結果を踏まえ、本研究ではサイズ5×5の平均値フィルタを用いてノイズ除去を行った。

#### <4.2> 総合評価方法

本手法では直線特徴の距離SLと曲線特徴の距離CL、2つの距離から総合的な距離を求め、テストデータと各登録者の基準データとの最終的な類似性評価を行う。しかしSLとCLではスケールが異なるため、両者を統合した新たな指標が必要となる。

そこで、式(9)のように基準値(SL0,CL0)により標準化したSLとCLの線形和で総合評価を行う方法について検討した。具体的には、まず各登録者について得られた距離より中央値、最小値、平均値を特徴別に求める。そして各値を基準

表2 評価方法による識別精度の違い  
Table 2 Estimation method and correct identification rates

| データ<br>特徴量 | "情報工学科" | "あいいうえお" | 平均正答率 (%) |
|------------|---------|----------|-----------|
| Lcen,p     | 81.63   | 89.25    | 85.44     |
| Lmin,p     | 83.88   | 90.27    | 87.08     |
| Lave,p     | 81.63   | 89.32    | 85.48     |
| 直線特徴       | 75.96   | 65.96    | 70.96     |
| 曲線特徴       | 67.62   | 82.50    | 75.06     |

値(SL0,CL0)とした場合の総合評価法をそれぞれLcen,p、Lmin,p、Lave,pと定義し、識別精度の比較実験を行った。

これら3通りの総合評価法による識別結果評価法の有効性確認のため、従来我々が用いてきた直線特徴に基づく評価法<sup>1)</sup>、および本研究で開発した曲線特徴に基づく評価法をそれぞれ単独で適用した場合に得られた結果を表2に示す。総合評価法では、Lmin,pで最も良い結果が得られたため、文献(6)と同様に最小値で標準化した両距離の線形和であるLmin,pを総合評価指標とした。

直線性と曲線性の特徴を単独で評価した識別結果と比較し、直線部の多いデータ"情報工学科"、また曲線部の多いデータ"あいいうえお"の双方で、総合評価指標を用いることにより識別精度は大きく向上していることが分かる。以上の結果から、筆跡の直線部および曲線部から個人の書き方の特徴を抽出する筆者識別法の有効性が確認できる。

#### <4.3> 処理コスト

本手法を用いた場合の処理コストについて検討する。識別に必要な処理時間と記憶容量はプログラム構造と計算機性能にも依存するが、参考までに実際に各データ算出に要した処理時間と記憶容量を表3に示す。計算機はFujitsu S-7/400U(CPU:UltraSPARC-II 300MHz)を用いた。なお、処理時間や記憶容量は文字、あるいは筆記者により多少の違いがあるため平均値を記した。なお、特徴平面においては変化の少ない部分が多いため、同じ数値が連続する場合その連続数を格納する簡単な圧縮プログラムを使用した。圧縮率は曲線特徴、直線特徴、基準データに依存して変化するが、結果的には、概ね、65～90%程度となっている。

例えばN人の登録者が存在して5字からなる筆記データの各文字について識別を行う場合、表3より処理時間は、

$$T = 5 \times \{t_1 + t_2 + N \times t_c\} \quad (10)$$

記憶容量は、

表3 処理時間と必要記憶容量  
Table 3 Processing time and required memory size

| 処理内容    | 処理時間(sec) | メモリ容量(KB) |
|---------|-----------|-----------|
| 曲線特徴の抽出 | 0.13 (1)  | 63 (c1)   |
| 直線特徴の抽出 | 0.58 (2)  | 195 (c2)  |
| 基準データ作成 | 1.50 (3)  | 677 (cb)  |
| 類似度の計算  | 1.87 (4)  | -         |

$$C = 5 \times \{c1 + c2 + N \times cb\} \quad (11)$$

となり、処理コストは、約(9.4N+3.6)秒、約(3385N+1290)KBと概算できる。

現在、本手法のソフトウェアは計算速度よりもデバッグや変更が容易に実行できるようなプログラム構造となっており、かなり冗長性があることを考慮すれば、識別の正答率が表1のような値で許される用途に対しては、実用化が可能な範囲の処理コストであると考えられる。

## 5. おわりに

手書き文字中の直線部と曲線部に存在する個人特徴を、ハフ変換、および文字画像中の曲線部への円のあてはめにより求める手法について検討した。本手法の特徴として、細線化した入力画像から情報を抽出するため、線幅や濃度といった筆記具に依存する不安定な情報を排除でき、ストローク形状より個人特徴を抽出するために、処理コストを低減できることが挙げられる。直線、曲線、何れも単純な特徴量の割には共に70%以上の識別率が得られることを明らかにした。また、個人識別という目的に沿って両特徴を統合すると、簡単なアルゴリズムの割には筆者識別実験で平均約88.43%の正答率が得られ、本手法の有効性が確認できた。

本研究で提案した曲線性に注目した個人特徴には、

- 1) ストロークの曲率が小さい、すなわち当てはめる円の半径が大きいほど量子化誤差の影響が大きい
- 2) 異なるストロークから同様の中心位置が求まった場合でも、その情報を区別することができない
- 3) 入力画像に適合する円弧の中心座標が既定の範囲を超えた場合、曲線性に関する特徴の一部が欠落する問題が残されている。このうち、3)については、今回は文字画像のサイズ(図1の文字「あ」で50×73pixel)に対して倍程度の大きさをもつ領域(150×150pixel)を考慮することにより対応した。特徴の欠落を完全に防ぐことは不可能であるが、曲線特徴の記述に十分な領域を実験的に決定することである程度の対処は可能である。この問題は、上記1)、2)も含めて今後の課題である。

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